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ECHOES FROM THE NASHVILLE MEETING

The Fourteenth Annual Meeting of "The Potato Association of America", which was held at Nashville, Tennessee, December 28 to 30, proved to be one of the most interesting meetings ever held by the Association. The attendance, however, was somewhat disappointing, but this was somewhat compensated for by the interest taken in the papers by those who were present. All of the sessions with the exception of the joint meeting with the Phytopathological Society, were held in the Home Economics Building of the George Peabody College for Teachers. The first session of the meeting which was held on the afternoon of December 28th, was opened with an address of welcome by Dr. Kary C. Davis who welcomed the Association on behalf of Nashville and the College. This was followed with a suitable response on behalf of the Association by President H. C. Moore of East Lansing, Mich., after which the reports of the Secretary, Treasurer and Editor of the American Potato Journal were given. Following these business reports were those of the standing committees on Research, Varietal Nomenclature and Strain Testing and Seed Certification, which occupied the remainder of the session.

The Thursday forenoon session was devoted to a symposium on the general subject of "Potato Storage and Marketing". One of the most interesting of these papers was that by R. C. Wright and W. M. Peacock of the United States Department of Agriculture regarding the effect of cold on potatoes stored immediately after harvesting. A careful study of the effect of different temperatures and humidities on the vitality of the tubers and the healing over of wound injuries indicated that at temperatures below 50 degrees F. more or less injurious effects were obtained. At 32 degrees F. the injury was quite severe even to the extent of killing a large proportion of the eye buds, so that no germination was obtained from many of them and others were so weakened that they did not produce a strong healthy sprout. Marked shrivelling and even decay

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in many instances resulted from injuries. At 36 degrees the injury while not quite so severe was still sufficiently marked to cause serious loss either for table or seed purposes. At 40 degrees, which has generally been recognized as a suitable temperature for the early storage period, a considerable amount of injury was still noticeable. In a temperature of 50 degrees with suitable humidity no eye injury was noticeable and the healing over of wound surfaces was nearly, if not quite, perfect. At temperatures of 60 degrees and 70 degrees F. with proper humidity the healing over of wound injuries was somewhat more rapid and more nearly perfect. High humidity was found to favor suberization of wound surfaces, while low humidities retarded or prevented it.

In a second paper by the above authors it was shown that by subjecting seed potatoes to higher temperatures and humidities than that in which they have been carried through the storage period, for a period of two or three weeks prior to planting, quicker germination, earlier maturity and larger yields were secured.

Dr. C. O. Appleman of the University of Maryland presented an interesting paper based on results obtained from a comparative study of varieties with respect to physiological shrinkage in storage. It was shown that certain varieties lose more water and carbon dioxide in storage than do other varieties under identical environmental conditions. It was further evident that the greatest loss occurred during the first few weeks of storage, and that this loss was proportionate to a certain extent at least, to the degree of maturity of the tubers when harvested. The less mature the tubers the higher were the weight shrinkages.

Some interesting data were presented in cooperative marketing and shipping point inspection by A. W. McKay and F. G. Robb of the United States Department of Agriculture.

A joint session was held Thursday afternoon with the American Phytopathological Society to afford the members of the Association an opportunity of listening to papers dealing with potato diseases, insect tranmission of virus diseases and the effect of screen inclosures for excluding insects together with the windbreak effect of wire screening on the general growth of the inclosed plants.

Dr. B. L. Richards' paper on "Yellows" discussed a new and destructive disease of the potato. In this paper the author showed the relationship of the "Hopping Louse" to the spread of this disease. In some sections of Utah according to Dr. Richards, the early potato crop was so seriously injured by "Yellows" that it was not worth harvesting. The late crop was also affected but not to the same degree.

The forenoon session on Friday was devoted to a series of papers on seed treatment and disease control methods. Two rather interesting papers were read on seed treatment, while a third, owing to absence of the author, was read by title only. In the first of these papers, prepared jointly by G. F. Niles and C. R. Orton,

striking results were shown from the use of organic mercury compounds in the control of common scab and rhizoctonia. One of the most interesting results obtained aside from scab reduction was that of a considerable increase in yield from seed treated with the organic mercury compounds over those treated with formaldehyde or corrosive sublimate solutions. The results obtained by Niles and Orton were in striking contrast to those reported in a following paper by Goss and Werner of Lincoln, Nebraska. In their experiments better scab and rhizoctonia control were obtained from the hot formaldehyde and cold corrosive sublimate treatments than from the organic mercury compounds. No stimulating effects were observed from the organic mercury compounds. Apparently soil conditions and possibly temperature relations are important controlling factors.

Interesting results were reported by Ernest Alsobrook of Alabama on the use of chemicals for hastening the sprouting of seed potatoes.

A comparative study of the relative effect of cutting seed potatoes in advance of date of planting as reported by P. M. Lombard of Presque Isle, Me., indicated that under good storage conditions it is possible to cut seed from two to three weeks in advance of planting and get practically as good a stand and yield as from fresh cut seed.

A strain test of seed potatoes was reported by W. C. Edmundson of Greeley, Colorado. It was shown that great variations in yield between different strains of the same variety are of common occurrence and point to the desirablilty of giving more attention to the relative merits of different strains.

At the final session of the meeting which was held on Friday afternoon, December 30th, E. D. Askegaard, an enthusiastic seed potato grower of Moorhead, Minn., discussed the advantages of growing seed potatoes on the tuber unit basis by the use of a horse-drawn tuber unit planter, which automatically cuts and plants the individual tubers. The construction and operation of the planter was explained in some detail. This paper was followed by a similar one presented by F. M. Harrington of Bozeman, Mont., who advocated tuber unit planting as the correct procedure for raising the standard of certified seed potatoes. Professor Harrington has successfully adapted the Iron Age two-man planter in planting on the tuber unit basis, by constructing a rack with several tiers of receding shelves which fits over the hopper and the horizontal distributing disk. The individual tubers are cut by hand and placed in empty tomato cans which are stored on the shelves. The operator in the rear by working rapidly can spill the four seed pieces out of the can into the pockets of the revolving distributing disk, replace the empty can as the next one is picked up and do it quickly enough to permit of continuous movement of the planter.

By having several racks and two men cutting there is no delay except that involved in replacing an empty rack with a newly filled one. It has been possible to plant four acres a day with this adaptation. A somewhat similar adaptation of the Iron Age planter was reported in a paper by Mr. Fred H. Bateman. Lantern slides were used to illustrate the adaptation used.

The control of "hollow heart" as presented in a paper by Professor H. O. Werner of Lincoln, Nebraska, indicated that closer spacing in the row or the use of larger sized seed pieces tended to reduce the percentage of "hollow heart" tubers. Results of fertilizer experiments were reported by A. M. Musser of Clemson College, S. C. The prevention of seed piece decay was discussed by Professor J. T. Rosa of Davis, California.

Seed potato inspection standards and their application to the trade served as the basis of a paper prepared by Prof. J. G. Milward of Madison, Wisconsin. In the absence of the author this paper was read by Dr. Johnson. The data presented in a chart accompanying the paper indicated a gradual improvement in the quality of certified seeed potatoes in Wisconsin as a direct result of the seed inspection service.

Under the caption of "Some certified seed surmises", John S. Gardner of Lexington, Ky., brought out some very interesting facts and suggestions which evoked a lively discussion.

Professor J. A. McClintock of Knoxville, Tennessee, in his paper on "Fall crop Irish potato production in the South," emphasized the need of a more general production of late crop potatoes in the South by the farmer to supply his own needs if for no other reason. The difficulties of carrying over seed of the previous year's crop and the possibility of using first crop seed were discussed.

Many other comments might be made concerning the papers and discussions, but time and space does not permit. It may be of interest to the reader to learn that these papers will be published in full in the Proceedings of The Potato Association of America.

A PRELIMINARY EXPERIMENT USING CALOMEL AS A DIP TREATMENT OF SEED POTATOES

F. M. Blodgett, Cornell University, Ithaca, N. Y.

50:811

Monteith and Harmon[1] have reported that from the standpoint of control, toxicity and cost, the most satisfactory chemical for the control of brown-patch of turf is mercurous chloride (calomel). As this is a Rhizoctonia disease, black scurf, the question naturally arises, why not use the same chemical for the control of the Rhizoctonia disease of potatoes? One is led to ask this especially since a

1. Monteith, John, Jr. and T. Carter Harmon.—Fungicidal control of brown patch of turf. (Abstract) Phytopath. 17: 50. 1927.

number of other mercury compounds have proven similarly effective in the case of both diseases.

To seek an answer to this question a preliminary field experiment was laid out to include the following treatments:

1. Immersion in mercuric chloride (corrosive sublimate) solution 1-1000 for 2 hours.
2. Dip treatment in mercuric chloride 1-40.
3. Immersion in mercuric chloride solution 1-1000 at 52°C. for 4 minutes.
4. Dip treatment in Semesan Bel. 1-10.
5. Dip treatment in Calomel 1-10.
6. Untreated.

Potatoes of the smooth Rural type were used. Many of these potatoes had sclerotia (black looking spores), of Rhizoctonia on the surface of the tubers and were therefore considered desirable from the standpoint of this experiment. The percentage of virus diseases (mosaic, leaf-roll, etc.) in the crop from which these tubers were selected was low.

Quantities of these potatoes, sufficient for planting, were treated during the period from May 5 to 9. This allowed time for recovery from any temporary injury to the sprouts from the mercuric chloride. From a sample of each of these lots of potatoes sclerotia were removed and planted, without washing, in potato agar, (a culture favorable for the development of the disease), in petri dishes. The results of this test are given in table I. It was evident at once that something unusual had occurred in the cold mercuric chloride treatment as the sclerotia from this treatment grew quite as well as those from the untreated potatoes. What happened is not clear but as this experience is quite exceptional in the case of this treatment, the field results with this treatment will be omitted as not representative of this method of treatment and likely to cause confusion. It may be said that in the field they behaved in all respects like the untreated potatoes. The results given in table I indicate that hot corrosive sublimate treat-

Table I.—Results from planting Rhizoctonia sclerotia in agar in petri dishes.

Treatment	No. planted	No. forming colonies
None	50	43
Semesan Bel dip	50	2
Cold Hg Cl_2	50	44
Hot $HgCl_2$	50	0
Calomel dip	50	1

Table 2. Potato seed treatment experiment

ment was fully effective as far as could be judged from the limited number of sclerotia planted. The Rhizoctonia fungus not only

did not grow from the sclerotia but no other fungi grew. The sclerotia planted from the potatoes treated with the Semesan Bel dip and the Calomel dip behaved alike. In both cases numerous fungi grew out from the sclerotia plantings but the Rhizoctonia fungus seemed to be inhibited from growing in the medium around the sclerotia. In several cases there was some aerial growth directly from the sclerotia of a fungus that was thought to be Rhizoctonia but this was not quite certain as the characters of the aerial hyphae (a thread-like growth of a fungus) are not as distinctive, at least to the writer, as those of the submerged hpyhae. In only a few cases did the Rhizoctonia fungus succeed in forming colonies as indicated in table I

The field planting was made on June 4 after some delay due to wet weather. The treatments were replicated as indicated in table II. Each plot consisted of a row 130 yards long across a field and were thus approximately 1-37 acre in size. The soil was rather heavy for potatoes, being classified as Dunkirk silty clay loam. The planting was made with a two-man potato planter which dropped potatoes about 15 inches apart in the row. At planting time severe injury was evident on the potatoes dipped in concentrated mercuric chloride solution. No injury was evident from any of the other treatments. After planting the weather was cool so that the potatoes were relatively slow in coming up and conditions were favorable for attacks by the Rhizoctonia fungus.

About a month after planting, counts were made of plants that had come up in each row and these counts are shown in table 2. The following are the average number of plants per row for the different treatments:

Untreated	238.8 + or — 4.03
Hot $HgCl_2$ (mercuric chloride)	282.6 + or — 1.91
Calomel dip	280.0 + or — 3.41
Semesan Bel dip	267.8 + or — 2.22

All of these treatments gave increased stands over the untreated plots that were highly significant. The difference between the average in the plots treated with hot mercuric chloride, (corrosive sublimate) and the check was 42.8 + or — 3.96 plants per plot. As this difference is more than 10 times its probable error, no doubt can be entertained as to its significance. The Semesan Bel dip seems not to have given as good a stand as the other two treatments though the difference in this case is scarcely significant when the probable error is considered.

This difference in stand with the exception of the dip in concentrated mercuric chloride is believed to be largely due to attacks by the Rhizoctonia fungus as the sprouts from the seed pieces in the case of missing hills were commonly found to be attacked by this fungus when they were dug. Care had been taken in planting so that very few missing hills could be attributed to the lack of a seed piece.

Mr. de Jong's cauliflowers win first prize at Syracuse—

FROM way out in Red River Valley, six miles north of Winnipeg, came cauliflowers from Mr. Klaas de Jong, to win a first prize at the Convention of the Vegetable Growers' Assn. of America, held at Syracuse, N. Y.

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No further notes were taken on this field until digging time. This planting was a part of a large field of potatoes and it received the same treatment as regards cultivation and spraying as the rest of the field. There was only a moderate growth of tops. They were checked to some extent by hopper burn. No blight was found in the tops or on the potatoes at digging. The vines were still partly green at the time of digging on October 12.

These potatoes were dug with a potato digger but the potatoes in each row were picked up and weighed separately giving the yields shown in table 2. The yields are fairly consistent with the

TABLE II.—Potato seed treatment experiment

Row	Treatment	No. of plants per row	Yield in pounds per row
1	$HgCl_2$ 1-40 dip	233	196
2	Untreated	244	214
3	Hot $HgCl_2$	278	219
4	Cold $HgCl_2$	...	...
5	Semesan Bel dip	272	255.5
6	Calomel dip	270	240
7	Untreated	249	203.5
8	Cold $HgCl_2$	...	...
9	Calomel dip	296	245
10	Hot $HgCl_2$	275	264
11	Semesan Bel dip	275	266
12	Untreated	221	224
13	Calomel dip	287	256.5
14	Semesan Bel dip	262	279
15	Cold $HgCl_2$	...	...
16	Hot $HgCl_2$	289	294
17	Untreated	254	234
18	Semesan Bel dip	258	283
19	Hot $HgCl_2$	282	290.5
20	Calomel dip	270	285
21	Cold $HgCl_2$	...	...
22	Untreated	220	241.5
23	Hot $HgCl_2$	289	294
24	Cold $HgCl_2$	...	...
25	Semesan Bel dip	272	277.5
26	Calomel dip	277	275
27	Untreated	245	236.5

exception of that shown for plot 3 treated with hot mercuric chloride solution. In this case the yield is so low as compared with the other plots treated in the same way as to suggest that some error was made in weighing. It has not, however, been excluded from the averages in table 3. This table gives a summary of the average

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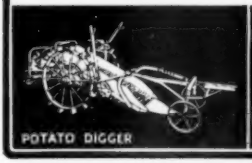

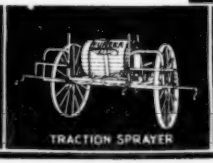

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yields and the gains of the treated plots over the check. It is evident that all of the treatments except the dip in a concentrated solution of mercuric chloride show a significant increase in yield over the check. The treatment in mercuric chloride solution 1-1000 for 4 minutes at 52°C, which may be regarded as a standard for comparison, gave an increase over the untreated of 46.7 + or — 10.6 pounds per plot which is equivalent of approximately 29 bushels per acre or if doubtful plot 3 be omitted the increase is 60.0 + or — 8. pounds or 37 bushels per acre. The Semesan Bel dip treatment gave an average increase in yield of 46.8 + or — 5.3 pounds over the untreated which is not significantly different from either of the above yields for hot mercuric chloride. The calomel dip treatment gave a slightly lower average yield than either of the above treatments though the difference proves not to be statistically significant. This is somewhat surprising in view of the good stand of potatoes on this plot as compared with the others and seems to have resulted from a lower yield per plant. While differences in yield per plant between the different plots are not significantly large they seem to suggest some slight toxic effect in the case of the calomel. This may well be due to the fact that nearly 14 times as much metallic mercury was applied in the calomel dip

treatment as in the case of the Semesan Bel dip treatment and suggests the trial of more dilute mixtures of Calomel for dip treatment.

Summary

A preliminary field experiment was conducted to test the use of calomel as a dip treatment for potatoes in comparison with a hot mercuric chloride treatment and a Semesan Bel dip treatment. A laboratory test indicated complete killing of Rhizoctonia sclerotia with the hot mercuric chloride treatment and a nearly complete inhibition of growth of Rhizoctonia with the Semesan Bel and Calomel.

Markedly and significantly better stands were secured on all of these treated plots as compared with the untreated. In this respect the hot mercuric chloride and Calomel dip treatments gave better average stands than Semesan Bel though the difference was hardly significant.

All of these treatments also gave significant increase in yield over the untreated. These average increases varied from 22 to 37 bushels per acre. The higher yields were obtained with the hot mercuric chloride and Semesan Bel treatments though the differences between these yields and the yields of the calomel treated plots is not significant. The trial of less concentrated mixtures of calomel seems to be indicated.

Table III.—Summary table of yields.

Treatment	Average yield pounds per row	Gain over untreated pounds per row
Untreated	225.6 + or — 4.03	
Hot $HgCl_2$	272.3 + or — 9.75	46.7 + or — 10.55
Semesan Bel dip	272.4 + or — 3.44	*46.8 + or — 5.30
Calomel dip	260.3 + or — 5.82	34.7 + or — 7.08

*Note 46.8 pounds per plot is equivalent to 29 bushels per acre. To convert these yields to bushels per acre multiply by 0.62.

THE 1928 POTATO OUTLOOK

Wm. Stuart

While it may not be possible at this early date to accurately predict the probable range of prices that are likely to be secured for the remainder of the 1927 potato crop or to determine the acreage that is to be planted it is not too early for the potato grower to begin giving the matter of acreage, at least, his very serious consideration. The season's range of prices have not been sufficiently

(Continued on page 21)

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CROP AND MARKET NEWS

POTATO MARKETS SLIGHTLY FIRMER. PROSPECTS IN THE SOUTH

(Contribution from Federal Bureau of Agricultural Economics)

Slight rises and declines for potatoes left the general situation only a little stronger than a month ago. Severe winter weather in northern producing sections temporarily slowed down the movement of this crop, but shipments were again becoming active. Total for the month ended January 14 was about 15,000 cars, the same as last season. Colorado and Idaho were increasing their output, and the western territory probably will make heavier shipments than usual, in order to get its larger surplus to market before the southern crop competes. Renewed activity also was noted in Maine and the North Central region. Shipping-point prices ranged from low mark of 75 cents per 100 pounds in southern Idaho to top of $1.70 in western New York. Prices in northern Maine and in the North Central States were on about the same level, with Maine holding a slight advantage; a range of $1.20-$1.55 prevailed in these sections. Low level on northern Round Whites in the Chi-

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cago carlot market was $1.40, and high price on Long Island Green Mountains in New York City was $2.35. Idaho Russet Burbanks advanced 25 cents in the Chicago market during the month. Early arrivals from the South and from Bermuda were bringing good prices.

Final crop report was increased only slightly over the November estimate and now stands at 402,149,000 bushels, compared with a revised 1926 crop of 354,328,000 bushels. With 278,000,000, the 19 surplus-producing late-potato States have slightly less than their five-year average figure and only about 26,000,000 bushels more than in 1926. Of that total increase, nine western States are credited with 22,000,000. Among the important late-shipping States, an increase of 1,400,000 bushels was made for Pennsylvania, 500,000 for Michigan, 600,000 for Minnesota and 1,000,000 bushels increase for South Dakota by December 1. These gains and others were partly offset by decreases elsewhere. Average farm price per bushel in December was estimated at 96 cents, or 45 cents less than in December, 1926. Average yield this season increased to nearly 115 bushels per acre. Per-capita production, on the assumption of 119,000,000 persons in the United States, is about 3.38 bushels, which is quite moderate. A record yield of 570 sacks, or 64,700 pounds, of potatoes from one acre was established in the Delta region of California.

Florida reports substantial increases in the planting of early potatoes for marketing during January, February and March, but the Hastings section, which ships during the spring, may have about the same acreage as last season. Total commercial potato area in Florida is indicated as 30,000 acres, or only 2,000 more than in 1927. Prospective plantings of early crop in the lower Rio Grande Valley of Texas have been reduced sharply to about 9,000 acres and are more in line with those of the 1925 and 1926 seasons. Reports from the Norfolk section of Virginia indicate nearly the same acreage as in 1927, but the Eastern Shore is likely to show an increase.

Imports from Canada have been only about one-third as heavy as to this time last year. Production in Canada is now estimated at 80,000,000 bushels, or about 1,300,000 less than the 1926 crop. Approximately 80 per cent is of merchantable quality. Production of Canadian certified seed potatoes was 65 per cent greater than in 1926 and totaled 4,170,000 bushels.

REVIEW OF RECENT LITERATURE

BAILEY, C. F.—[Potato experiments in New Brunswick].—*Canada Expt. Farms, Fredericton (N. B.) Sta. Rpt. Supt. 1926, pp. 29-38, 52-54.*

Sprouting was found to increase the crop of Irish Cobblers for early digging, whereas for late digging the crop was larger from unsprouted seed. Sprouting has always increased the crop of

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Green Mountains. Irish Cobbler seed from late plantings gave a little better yield than seed from early plantings, whereas seed from late planted Green Mountains has not increased the yield on the average. Green Mountain potatoes dug early produced a better crop than those dug late in the season. On land comparatively weed free, potatoes in a 3-year rotation produced similar marketable crops from one, two, and three cultivations and slightly less from four.

Comparisons of methods indicated that when 1,500 and 2,000 pounds of fertilizer per acre are applied for potatoes, application in the row and mixing with earth will give best results. When fertilizer salts were applied in the row in contact with the seed and the other constituents usually found in a ton of 4-8-10 fertilizer were broadcast, ammonium sulfate and sodium nitrate apparently reduced the percentage stand, and while potassium chloride did not depress the stand much, its use was accompanied by the lowest yield. Best results were had with acid phosphate applied in the row and the other chemicals broadcast. Yields with fertilizer applied below the sets were slightly larger than with it above the sets.—**Henry M. Steece.**

CLARK, C. F.—**Types of sterility in wild and cultivated potatoes.**—*Mem. Hort. Soc. New York, 3 (1927), pp. 289-294.*

Studies on cultivated varieties, wild species, and species hybrids belonging to the tuber bearing section of the genus Solanum revealed the existence of four types of sterility. Inhibition of fruitfulness resulting from premature abscission of buds and flowers occurred in **S. tuberosum,** and pollen abortion or intersexualism was present in all varieties of this species. Pollen sterility, probably of this type, was also present in **S. commersonii.** Sterility of hybrids involving both male and female organs was found. Physiological incompatibility caused complete self-sterility and also cross-sterility except in certain combinations of crosses. This type occurred in **S. caldasii glabrescens** and in **S. chacoense.—Henry M. Steece.**

LIVERMORE, J. R.—**A critical study of some of the factors concerned in measuring the effect of selection in the potato.**—*Jour. Amer. Soc. Agron., 19 (1927), No. 10, pp. 857-896, fig. 1.*

Studies at Cornell University were concerned with some of the more obvious sources of error in interpreting results of selection experiments with potatoes. Chance being given free rein, there seemed no significant difference in the yield from one-half of a tuber compared with the yield from the other half.

The yield of the two hills adjacent to a single hill skip appeared to be increased at least 40 per cent and possibly more because of the skip, and similarly the yield of the two pairs of hills adjacent to a double hill skip is increased at least 75 per cent and possibly more. The effect of missing hills appears to be markedly influenced by soil and climatic conditions, whereas variety and size of seed

piece are not so important in this regard. The author believes that in general less error will be made in potato field trials of any sort if the effect of missing hills is disregarded entirely. Observations on plat technique suggested that under conditions similar to those of the experiment single row plats about 36 feet long and replicated four times will give a reasonable degree of accuracy in comparative field trials with potatoes.—**Henry M. Steece.**

LOOMIS, W. E.—Temperature and other factors affecting the rest period of potato tubers.—*Plant Physiol., 2 (1927). No. 3, pp. 287-302, figs. 4.*

The rest period of dormant potato tubers was broken in four weeks by storage during July in a low-roofed building during investigations at the University of Arkansas. The extensive studies demonstrated the efficacy of storage temperatures around 30 degrees C. in shortening the dormant period of potato tubers and the importance of high soil temperatures for the rapid germination of partially dormant tubers. Storage in damp moss, as compared to dry storage, at high temperatures reduced shrivelling and rot loss following planting, presumably because of the more rapid formation of a wound periderm in the turgid tubers, but had no direct effect upon the rest period.

When selected from a lot of freshly dug potatoes, 3 and 4 ounce tubers germinated more readily and made a stronger growth than 1 and 2 ounce tubers from the same lot, although the difference was lost as the tubers passed through the rest period. Composted soils and low concentrations of nitrogenous fertilizers had a stimulating effect on the germination of dormant and partially dormant tubers, which was not observed in tubers which were completely out of the rest period.

[Potato experiments in Arkansas].—*Arkansas Sta. Bul. 221 (1927), pp. 23, 24.*

Experiments by the Arkansas Experiment Station showed that with a heavy soil such as that at Fayetteville, from 500 to 600 pounds per acre of an 8-4-0 (P-N-K) or a 12-4-0 fertilizer in the drill at planting gave the best results. On lighter soils, found in central and southern Arkansas, a complete fertilizer such as 8-4-4, 10-4-4, or 10-6-4 seemed preferable, applied similarly. Phosphorus was the only element which gave definite returns when used alone. Row application of fertilizers has been more economical than broadcasting.

The rest period of freshly dug potatoes was successfully broken by treatment with ethylene chlorhydrin, or diluted lime sulfur, or by storage for 4 weeks at the ordinary temperature existing at harvest. Such chemical treatment, however, did not seem necessary in the central and southern parts of the State. Peeling and cutting seed before planting and also fertilizers high in nitrogen appeared to have a certain influence in speeding germination.—**Henry M. Steece.**

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TALBERT, T. J. and J. T. QUINN.—[Experiments with potatoes at the Missouri Experiment Station].—*Missouri Sta. Bul. 256 (1927). pp. 76-78.*

Irish Cobbler and Early Ohio potatoes outyielded other early varieties tested, and a strain of Irish Cobblers from Canada showed more plant vigor and a slightly greater yield of No. 1 potatoes than strains from the northern States. Northern-grown certified seed continued to surpass home-grown or northern-grown uncertified seed. Plantings of Irish Cobbler and Early Ohio varieties on March 25 yielded more than earlier or later plantings. A 3-12-4 (N-P-K) fertilizer applied at the rate of 400 pounds per acre plus 8 tons of barnyard manure produced the highest yield. A 500-pound application gave the most economical returns in a rate of application test of fertilizers.

Hot formaldehyde (1 pint: 15 gallons of water) at 122 to 124 degrees F. gave very satisfactory control of scab and Rhizoctonia. Cold corrosive sublimate (4 ounces: 30 gallons of water), the potatoes being soaked for 1½ hours, and Semesan gave about the same control. In a comparison of the effect of different methods of mixing Bordeaux spray on the potato plant no burning was noted from any of several mixtures. Although the fungicidal value of the mixtures was not observed, it would seem that under Missouri conditions the method of mixing Bordeaux spray will not greatly affect its stimulating or insecticidal value.

attractive thus far to justify any considerable increase in 1928 plantings. Information secured through trade papers and private individuals indicate a 7 to 8 per cent acreage increase in Florida. Such an increase may be justified in view of the lighter 1927 late crop in the northeastern United States. In any event it is not a serious increase. It is believed that the conservative grower will not materially increase his acreage over that of last season. In our opinion there should not be over a five per cent increase in the eastern part of the country and a decided reduction in some of the Western States. Minimum acreage and maximum yields per acre should be the slogan of every progressive potato grower. Potato producers of the future must have as their objective the reduction of the unit cost of producing potatoes. The man who can profitably porduce potatoes for 50 cents a bushel has a distinct commercial advantage over his neighbor who cannot do it under 75 cents per bushel.

Potato production like any other commercial industry must become standardized as to efficiency of methods employed in growing the crop. The 400 bushels per acre club of Pennsylvania and the more recent 600 bushel club of the San Luis Valley in Colorado are serving to demonstrate the fact that large yields are possible to those who are willing to practice modern methods of soil preparation, supply the necessary plant food elements, use the best seed and use it liberally, cultivate the crop intelligently and spray thoroughly for insect pests and diseases. The careless grower who prepares the land indifferently, neglects to supply sufficient plant food, uses diseased seed stock, lets the weeds sap the soil moisture and draw on the inadequate food supply, who fails to control insects and diseases will sooner or later be eliminated because his cost of production will be greater than the returns received for the crop. Every prospective 1928 potato producer should decide to belong to the first rather than the last group of growers.

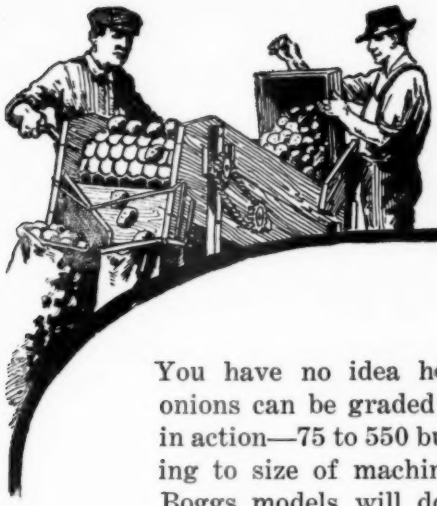
A SPECIAL APPROPRIATION REQUESTED FOR POTATO INVESTIGATION

H. R. Bill 5482 was introduced in the House of Representatives on December 5, 1927 by the Honorable E. S. Brigham of Vermont. The object of this bill is stated to be as follows:—

To provide facilities in different localities in the United States for a more comprehensive cooperative study of the best known methods for the improvement of the potato.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of Agriculture is hereby authorized, independently or in co-

operation, to develop and test in various parts of the United States promising seedling potatoes developed by the Department of Agriculture, State experiment stations, agricultural colleges, associations, or persons; to make a more exact and comprehensive study of potato breeding, particularly with respect to the production of disease resistant varieties; to develop and test methods for the elimination of tuber-borne diseases; and to select, test, and standardize improved strains of important commercial varieties of potatoes and for such purposes there is hereby authorized to be appropriated, out of any money in the Treasury not otherwise appropriated, the sum of $35,000 to be available for expenditure during the fiscal year ending June 30, 1929, and the appropriation of such additional sums as may be necessary thereafter for the purposes of this Act is hereby authorized. In carrying out the provisions of this Act the Secretary of Agriculture is authorized to employ such persons and means in the District of Columbia and elsewhere as he may deem necessary.



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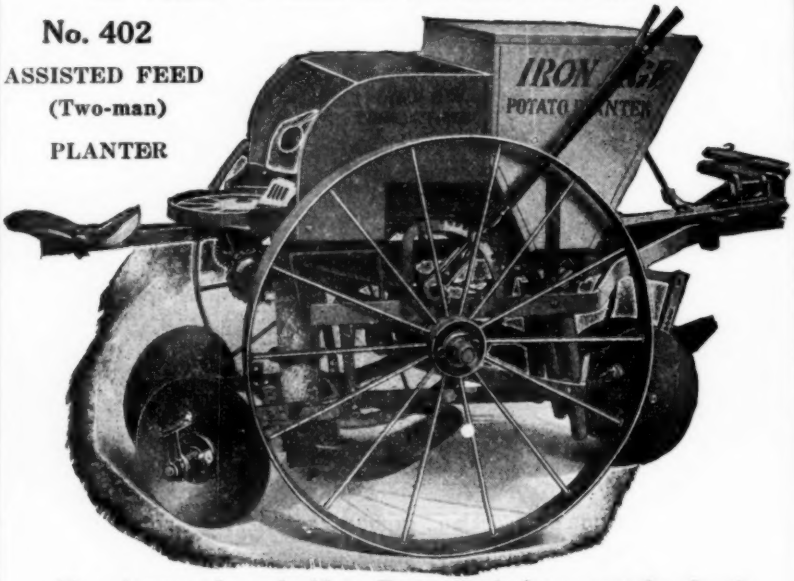

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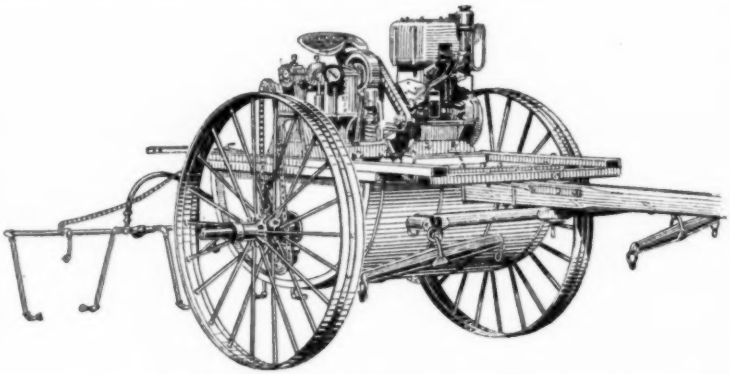

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Overproduction: of Potatoes and of Research

By FREEMAN WEISS, Assoc. Pathologist, Bureau of Plant Industry, U. S. D. A., Washington, D. C.

"There never was a time when it took so small a proportion of the population and such a small percentage of our resources to get the food and raw materials that we need. * * * One English author, Sir Daniel Hall, estimates that in the future only 15 per cent of the population will be needed to produce food and raw materials. As a natural consequence we have relatively low food prices and declining farm-land values; likewise, naturally, world-wide distress of farmers."

This statement is quoted from a recent analysis of the question of food and population by Professor R. T. Ely. Recently the view has been expressed that a large factor in the current agricultural depression is in fact the very efficiency of the farmer—his ability to win greater yields of crops from smaller areas and with less utilization of man power than ever farmers did before. This view is reflected in the feeling that has been growing, and is now receiving expression, in agricultural and business circles alike, that the Federal Department of Agriculture and the state experiment stations are devoting too much attention to measures for increasing crop production, and not enough attention to measures for increasing crop utilization.

In defense of these research organizations it may be said that their investigations hardly ever aim at mere enlargement of yields, without regard for the profitableness of increased production. For example, in conducting research on potato-seed improvement, pest control in the growing crop, and the elimination of waste in transit and in storage, the object has been to overcome those factors which are opposed to profitable production,

whose chief cost is not in their avoidance but in having to put up with them. Nevertheless, the acre yield of potatoes in the United States shows a general rise since about 1890, also the increase in total production has been consistently greater than the increase in acreage. The rate of increase has been distinctly greater since 1917, and it is probable that this trend will become even more marked. In some years many potato growers, though employing the most profitable known methods of production, have failed to make a profit on their crops because of general overproduction. Much has been said about developing new methods of utilizing potatoes in the industries, but thus far no very important progress has been made in this country in the development of technical processes for producing flour, alcohol, and stock food from potatoes, and much less in their commercial application.

To continue to recommend the expenditure of public funds for potato research, and even to urge greater research activity may therefore call for some explanation.

It is held by some that efficiency in crop production is itself a cause of overproduction, and out of this notion a rather badly strained and tenuous argument has grown that what we need in agriculture is not more efficient methods, and greater potential power of crops, but on the other hand that such natural restrictions as low yields and wastage through disease are necessary to guard against overproduction, and thereby insure prices that will be profitable even to the marginal producer. Would anyone think of applying this sort of logic to organized labor and to industry? We have seen the eight-hour day become the accepted standard of human toil in nearly all occupations except agriculture, but is labor more or less prosperous than under the ten-hour and longer day? The five-day week has been introduced experimentally in one of America's largest industrial organizations, and bids fair not only to persist, but to be copied. This particular organization, as everyone knows, has never been more prosperous.

This is not a suitable occasion or place to elaborate the thesis which is suggested by these developments in labor and industry. Suffice it to say that one of the immediate aims of agricultural research is to raise crop yields by breeding more productive strains and by eliminating the losses due to diseases and pests until the capital outlay, as measured by the use of land, and the labor required of farmers to secure a respectable income also may be encompassed within a 40-hour week. When that aim has been realized, research will set about the further abbreviation of necessary toil.

In view of these considerations it should not be difficult to show valid reasons for continuing and extending research on such enterprises as breeding more productive and disease resis-

tant crops, but some of the minor sources of economic losses may be overlooked. For example, certain diseases cause losses which are seldom large in the aggregate, though in individual cases or in certain localities they may reach significant proportions. It is a fact, however, that hardly any problem of potato disease control has been adequately solved, though for practical purposes in many localities known control measures may suffice. This preemption of the simpler problems, and the lessened economic importance resulting from the development of partial control measures sometimes combine to dispel any further interest in these problems. Our science furnishes numerous examples of such abbreviated researches. Thus, we do not know why late blight appears suddenly and becomes widespread and destructive in some localities at intervals of five or more years, yet in the interim is so infrequent that it is difficult or impossible even to find occasional specimens. Many growers in New Jersey, Maryland, and Virginia would have profited considerably last season by knowing how to recognize and control late blight, though past experience for many years had shown no need for this information. We might profitably recall that conic sections were studied as mathematical curiosities for 1800 years before they were found to be the key which led to the fundamental law of gravitation.

In some potato sections, seed treatment is thought to be the sufficient solution of the common scab problem; in others, the application of sulphur to the soil is so considered. There are instances, however, of neither of these measures, nor of green manuring in addition, being entirely effective. Is this due to different strains of the scab organism, or to particular biological and chemical properties of the soil? We know only that none of our existing information seems to offer a sufficient clue.

In the east, wilt has been relegated to comparatively minor importance in comparison with the virus diseases as a problem for either potato growers or certification officials. It is true that wilt may often be fairly effectively controlled by virtue of either seed selection or certain crop rotations, but no potato disease problem is more confused in etiology than this complex of premature decline and loss of turgidity and color in the tops, and vascular discoloration in the tubers. Much the same is true of the various pathological conditions known as internal brown spot and net necrosis. Seedpiece rot, weak germination, and missing plants, constitute another disease complex concerning which we are literally in the dark ages, knowing as yet next to nothing about the nature of the organisms which cause rot and how they come to be present, and lacking any effective means of control under certain seasonal conditions.

These are problems whose study can be successfully undertaken only by a thoroughly fundamental approach which may for a time appear to lead far from the direct path. The obvious fea-

tures have been explored. Further advance in the knowledge of seedpiece rot will require a study not only of the fungous and bacterial soil organisms which may attack potatoes, but of insect disseminators, and particularly of the physiological state of the tuber as affected by storage and by the soil environment. In connection with wilt we shall have in particular to study the nutrition of the plant and the water-supplying and other physical properties of the soil, as well as the relation of various soil organisms to the plant under exceptional environmental circumstances.

In the prospective trend toward research of a more economic and industrial character, it is to be hoped that a place can be found for continued attention to the sort of problems just referred to. Indeed, with the growth in prestige and representativeness of the Potato Association of America, the writer is hopeful that the association through its research committee may exert a coordinating influence on the research undertaken by federal and state agencies, to the end that these serious defects in our knowledge of potato diseases will not remain without attention.

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The Potato Situation in 1928 and Its Relation to the Use of Fertilizer

By H. R. SMALLEY, Director, Northern Division, Soil Improvement Committee of the National Fertilizer Association

I have been asked by the editors to discuss the fertilizer situation with respect to the 1928 potato crop, but before doing so I am going to give you briefly my impressions of the present outlook as to acreage, yield, and probable price.

When I sent out my third annual forecast on the potato crop about a year ago, I promised myself that I would quit predicting if I failed to hit the mark in 1927. The truth is that my last year's forecast was a partial hit, as will be seen by the following quotation:

"To sum up, the outlook for the potato grower for 1927 is a bright one. The acreage will not be unduly expanded on account of high seed cost; the yield per acre will, more than likely, be around 110 to 115 bushels per acre, but even so there is every reason to believe that the price will be satisfactory." The December 1st government crop report puts the average yield for the United States at 114.7 bushels per acre and the average farm price at 96 cents per bushel. I should add that my forecast on acreage last spring was 3,300,000 and that the actual acreage was 3,505,000 or considerably more than I anticipated. To be perfectly fair I should also state that considering the size of the 1927 crop—402,000,000 bushels—the price is somewhat higher than I expected. This may be due to the fact that late blight was prevalent in the northeastern states last fall and for this reason the market rather generally anticipated a larger amount of rotting in storage than usual. Or perhaps I didn't allow enough for the increase of 12 million in our total population since 1920—enough people to consume over 40 million bushels of potatoes annually.

Even with a farm price on December 1st of 85 cents a bushel in Maine, the situation in Aroostook is not such as to encourage an increase in acreage in 1928. On the other hand, a farm price of 85 to 90 cents in the Michigan-Wisconsin territory is high enough to stimulate some increase in acreage over 1927; in fact, I expect the expansion in acreage to be rather general this year, due to the lower cost of seed, and the total acreage to exceed 3,800,000. Such an acrage with an average yield of 110 bushels or over will mean an oversupply in the fall and a correspondingly low price.

Last year I pointed out that when the cost of seed potatoes is

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New Jersey Experiment Station tests with applications of 1,400 pounds of 3-8-0 against the same amount of 3-8-8 consistently produced long, thin tubers from the "no potash" plot, and short, chunky tubers from the "potash" plot.

Potash contributes vigor and health to the plant and strengthens the tissues of the potato, thus improving its keeping quality. Potash transfers starch through the potato plant and centers it in the roots for the production of tubers.

If you are getting unsatisfactory results in yield or quality from your sweet potato crop, it is quite likely that more potash is needed. A good plan is to compare several analyses having the same percentage of nitrogen and phosphoric acid, varying the percentage of potash 6%, 8%, 10%, 12%, and 14%.

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lower than in the year previous, there is a tendency for growers to use less care in planting, cultivating, spraying, and fertilizing, all of which results in a lower yield. For this reason I believe that the yield per acre in 1928 is likely to be less than in 1927.

All things considered, however, the chances are that the crop of 1928 will be well over 400 million bushels and the average farm price well under a dollar a bushel. It is therefore no time to expand acreage, and the intelligent grower will proceed along conservative lines.

What About Fertilizer?

Now having urged conservative action as to acreage, what policy should the intelligent grower adpot with respect to the use of commercial fertilizer?

In the first place, I should explain that fertilizers will be somewhat higher in price in 1928 than they were in 1927 for the very simple reason that there was an underconsumption in 1927 in the cotton states and as a result manufacturers engaged in a price war that resulted in much fertilizer being sold below the cost of production. This year there is a good demand for fertilizer in the southern states, prices of fertilizer materials have risen somewhat, and mixed fertilizers are naturally higher.

Fertilizer is so essential to profitable production, however, that there should be no stinting of the application even though the cost be slightly higher. The wisdom of liberal fertilizing to hold down the bushel cost is shown by the results secured in actual experiments and by cost studies that have been made by the Bureau of Agricultural Economics.

The United States Department of Agriculture has reported the results of six experiments on as many soil types in Maine, New York, Pennsylvania, New Jersey, and Virginia. In each case a 4-10-6 fertilizer was used at the rate of 1200 to 2000 pounds per acre. The average of the six experiments for three years is as follows:

With fertilizer	230 bus.
Without fertilizer	149 bus.
Increase	81 bus.

The Bureau of Agricultural Economics has studied the cost of growing potatoes on several thousand farms. The average cost for the United States was $76 per acre in 1925, and it is probably fairly uniform from year to year. The average yield was 112 bushels, and the average cost of growing a bushel was 68 cents. Now if it is assumed that $25 worth of high-analysis fertilizer will give an increase of 80 bushels per acre, the cost per acre

would be $101, but the cost per bushel would drop to 53 cents. Such an increase in yield would raise the cost of harvesting and marketing slightly, but the improvement in quality would in most cases much more than offset these increased costs. Surely an extra profit of 15 cents a bushel is worth while. To state it in another way, 80 extra bushels can be grown up to harvest time at a cost of 31 cents per bushel. The increase from fertilizer will, of course, vary considerably with the season, the soil type, the quality of seed used, and with the thoroughness of the spraying, but 80 bushels is believed to be a fair average increase.

In closing, let me again urge conservatism as to acreage, the use of good seed, thorough spraying, and adequate fertilizing. Such a policy will win even in an off year.

Environmental Conditions and Seed Potato Productivity

By H. O. WERNER, University of Nebraska, Lincoln, Neb.

Potato growers in various parts of the country will probably be interested in a bulletin which will be published in the near future by the Nebraska Agricultural Experiment Station. This bulletin deals with the relation of environment to the value of the potatoes for seed purposes. It is based upon experimental work conducted in various parts of Nebraska during the years 1919 to 1927. Some of the preliminary work has been reported in previous Nebraska bulletins and in the 1925 and 1926 annual reports of the Potato Association of America. The work was conducted on a sufficiently extensive scale during enough seasons to warrant the drawing of fairly definite conclusions.

The one conclusion of greatest significance is that throughout the literature and throughout the numerous experiments reported it has been impossible to find that environment was of any consequence as a major factor influencing the productiveness of seed potatoes, when disease was not present. However, in the presence of disease, especially spindle-tuber, environmental factors were very important.

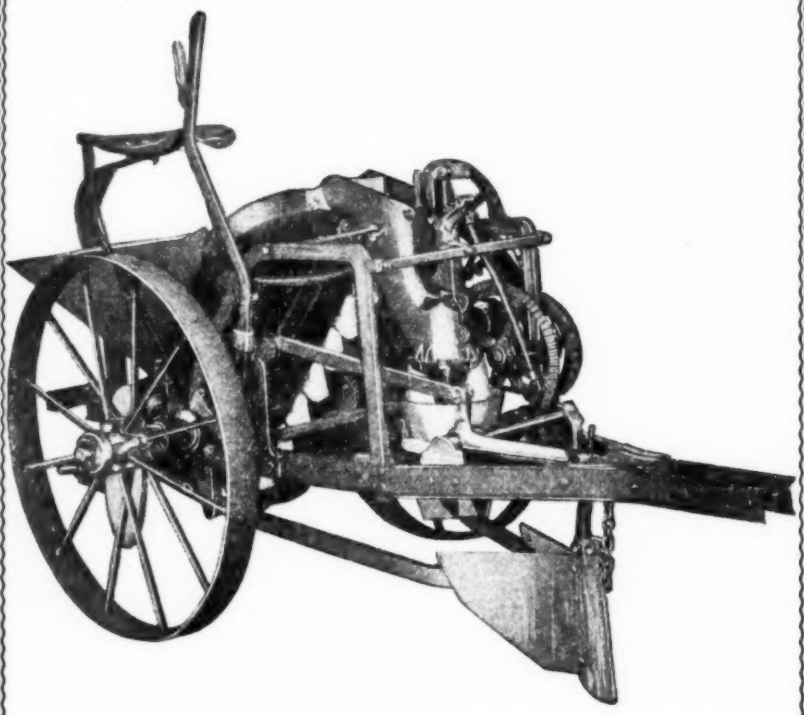
The data being presented show that when spindle-tuber was present in a stock of seed, the spread of the disease and consequent reduction in yield was very much greater in: (a) irrigation fields than in dry land fields; (b) eastern and central Nebraska than in western Nebraska; (c) early planted than in late

planted stocks; (d) late harvested than in early harvested stocks, and (e) cultivated than in straw mulched stocks. When healthy stocks that were practically free from disease, were planted, good seed stocks of apparently equal productivity were produced under all the conditions mentioned.

In connection with the matter of maturity, when lots of seed contained spindle-tuber infection, it was repeatedly observed that the disease freedom and productivity of the stocks were inversely proportional to the length of time the parent plants were allowed to remain in the field. Seed potatoes produced during a given number of days in late summer and early fall were slightly more productive than those produced in the same number of days during spring and early summer. When spindle-tuber was eliminated from seed stocks it was impossible to detect any appreciable differences in yield the following year, with the following exceptions: That very immature tubers, apparently physiologically undeveloped, were inferior in productivity to tubers more fully developed, and, in eastern Nebraska especially, the differences in degree of dormancy in the spring caused differences in emergence and early growth rate, which differences were sometimes in favor of one lot of seed and sometimes in favor of the other, depending upon the favorableness of the weather conditions during June and July. In western Nebraska, on dry land, early or late planting exerted little effect upon the current season yield, but there early planting generally was undesirable because it resulted in the production of more scabby potatoes and the tubers were more elongated, consequently being less desirable, insofar as market demands were concerned. In the central and eastern part of the state the yields secured when planting late have been so unsatisfactory as to render this method impractical for commercial work.

When seed plats, located in the central part of the state and containing 20 per cent of spindle-tuber plants, were rogued on different dates, there was no evidence of spread insofar as the type and yield of the current crop was concerned. However, the following year the spindle-tuber content was found to be very great in the stocks from the unrogued plats, with the percentage of disease in the other plats decreasing in accordance with the earliness of the roguing date the previous year. Lots rogued late when vines were maturing were almost as poor as unrogued lots.

Each year a number of healthy potatoes were grown in the greenhouse or under insect proof cages where the plants were protected against infection by insects. In the greenhouse some sets of potato plants were grown with soils of different texture and structure, other sets were supplied with all degrees of soil moisture ranging from drought to almost saturated soil conditions, and other sets were grown with different soil and air tem-



THE value of tuber uniting seed plots and fields to be certified is conceded by every State Department to be the only means which allows of adequate inspection. Read what one group of growers has to say about the Tuber Unit machine used last year: "This planter was bought by six certified seed potato growers and has been used this spring and they are well satisfied with its work." One Minnesota man has used a Tuber Unit machine for three seasons and has practically eliminated disease in his fields. With the Tuber Unit machine the cost of planting on a scientific basis is enough less than the cost of planting in the old way to pay for the machine in one hundred acres from the standpoint of cutting alone. To secure a machine for this season write immediately to

BAKER VALVE COMPANY

1847 East 28th Street **Minneapolis, Minn.**

peratures, ranging from 55 degrees to 75 and 80 degrees Fahrenheit. Plants growing under insect proof cages were located in different parts of the state and were provided with different cultural, planting and harvesting conditions.

All these conditions exerted a very distinct effect upon the yield and shape of the tubers during the current season, but when these tubers were planted under comparable conditions the following season they were all of about equal productivity.

With the possible exception of the effect that environmental conditions might have upon the degree of maturity and the accompanying interference with the degree of dormancy at planting time, the experiments being reported indicate that with healthy seed stocks, environment is a factor of very little consequence insofar as its effect upon productive power is concerned. The differences commonly attributed to environmental factors are primarily due to the disease content which, however, is very appreciably influenced by environmental conditions.

There are many regions where, with the use of disease free seed stocks, it might be possible to grow one or two good crops of seed potatoes. However, considering the difficulties involved and low yields of seed tubers secured when producing seed under these special conditions (as late planting), the production of seed will probably continue to be limited to the northern and higher altitude regions. On the other hand, in these more favorably situated regions the seed grower must realize that the favorable natural conditions providd are not sufficient in themselves but are only a very distinct aid, insofar as seed potato production is concerned.

The Prospective Use of Concentrated Fertilizers on Potatoes in 1928

By B. E. BROWN, Bureau of Chemistry and Soils, U. S. Department of Agriculture, Washington, D. C.

Will there be an increase in the production of concentrated fertilizers in 1928? Will potato growers use more of such mixtures during the coming season? Experimental and practical results so far secured indicate that both of these questions can be answered in the affirmative.

Last year, for example, one commercial company put out enough 10-16-14 goods in Aroostook County, Maine, to take care of 2,000 acres of potatoes. Practically all of this concentrated fertilizer was applied at the rate of 1,000 pounds to the acre.

Special Potato Fertilizers

A high analysis fertilizer is now available for fertilizing potatoes

NITROPHOSKA

15-30-15

15% Nitrogen, 30% Phosphoric Acid and 15% Potash. Owing to the high analysis, only comparatively small quantities are needed.

UREA

46% Nitrogen=55.9% Ammonia. Pure organic plant food. In seven year tests it has given best results as a nitrogen carrier for potatoes.

LEUNASALPETER

Ammonium Sulphate Nitrate

26% Nitrogen=31.6% Ammonia. Largely used in potato fertilizer mixtures with excellent results.

Our soil scientists and fertilizer specialists will help you with your fertilizer problems.

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Those who saw some of the potato fields last August where the concentrated fertilizer was used pronounced them in fine condition with every prospect for good yields.

The cooperative experiments of the Department of Agriculture and the Maine Agricultural Experiment Station conducted on Caribou loam, at Mapleton, Maine, where some of this fertilizer was used, along with other concentrated fertilizers made up by the department, gave results showing that the concentrated mixtures on the whole were equal to the commercial. In several cases better yields were secured with the concentrated fertilizers, some of the yields giving as high as 360 bushels of Irish Cobblers to the acre. The various mixtures were applied at rates varying from about 630 to 1,000 pounds to the acre, all mixtures containing the same amount of the active plant-food constituents, ammonia, phosphoric acid, and potash. The concentrated fertilizers were compared against a high-grade mixture which contained 21 per cent of active plant food, a 6-9-6 formula being used.

Potato growers having large acreage and who use large quantities of fertilizer see an opportunity to effect savings in freight, in handling, in hauling, and in storage through the use of concentrated fertilizers. In the field at planting time a good deal of time and labor are expected to be saved and time saved means a great deal to potato growers in sections where the planting season may be backward.

Last August, at a meeting in Aroostook County, Maine, a leading grower expressed himself as being very much interested in the subject of concentrated fertilizer; in fact, so much so that he was using quite a lot of the so-called "double-strength" goods during that season with every indication of success. He, moreover, stressed the fact that by using one pound of fertilizer in place of two, with no less plant food, it enabled him to cut out considerable effort involved in the application of the fertilizer.

There are features connected with the use of concentrated fertilizers, particularly on light soils, that will have to be carefully considered and which will require some study before the free use of such fertilizers can be definitely recommended under all soil conditions.

However, if too great a degree of concentration is not attempted and the action of concentrated salt mixtures is determined under different soil and climatic conditions, it is believed that concentrated fertilizers will gradually fit in very well with modern fertilizer practice. In connection with the use of such mixtures it will be essential to have them in good mechanical condition so as not to interfere with uniform drilling at planting time and to work out methods of properly distributing them by mechanical means.

Trucking Potatoes to Market

By C. W. WAID, State Department of Agriculture, Columbus, Ohio

In the December issue of the Journal, we called attention to the fact that only a small percentage, 265 cars to be exact, of the ten million bushel potato crop produced in Ohio in 1926 was shipped by rail. We tried to show in that issue that the volume of potatoes which is hauled to various Ohio cities by motor trucks is sufficient to have a considerable influence on prices at the time of the year these potatoes are placed on the market.

In this issue, we want to point out one or two other influences which the increased use of the motor truck in hauling potatoes to market has brought about.

Government Estimate of Crop Movement Influenced by Use of Motor Truck

There is plenty of evidence, although the statistical information is limited, that the motor truck is being used to a greater extent each year in the hauling of potatoes to market.

G. V. Branch, Director of the Detroit Municipal Market, made the following statement in a letter received from him last November: "Just recently a State Department of Agriculture inspector who called at the office stated that all of the large potato shipping concerns who have shipping stations throughout the state are complaining a great deal about the competition of the buyer with the truck." In fact, he intimated, "it may be necessary to close some of their local buying stations in the near future unless conditions change."

County Agricultural Agent Ellwood Douglass, at Freehold, N. J., made the following statement in a letter received from him recently: "Eight years ago, three railroad centers in the vegetable and fruit sections of the country were shipping from 35 to more than 50 cars of perishables every day in the shipping season. The present season, there have not been more than five cars per day going from these three centers, while there has been an increase in the production in these sections."

If the rate of increase in the use of the motor truck was constant, it would be possible to estimate fairly accurately the increased tonnage of potatoes handled by trucks each season. However, as V. H. Church, Agricultural Statistician for Michigan, stated in a letter received from him recently, he has found that "the price factor has a distinct bearing on the amount of trucking done; for example, in 1926, the trucking of potatoes into Detroit fell off decidedly because the margin of profit was too small."

In a letter received from him a little later, he stated: "Since our discussion of the trucking problem, I have made a trip

through the potato belt of Michigan; I find there is a prevailing sentiment that the trucking movement this year, 1927, has been much greater than usual. This was due to the fact that the truckers could buy potatoes at prices and sell them at an advance which gave them a substantial profit."

This illustration together with observations made elsewhere indicates that the volume handled by truck varies considerably from season to season. However, the trend is toward a more general use of the motor truck in this capacity.

We are citing these facts to call attention to the danger of placing too much dependence upon the government estimate of crop movements when such estimates are based entirely upon carlot movements. We have no remedy to suggest for this situation, but believe that such estimates should be given out with a great deal of care so long as we have very limited information about the volume of potatoes moved with motor trucks. Furthermore, growers and dealers should take into consideration the possibility of the change in volume of potatoes so handled whenever they make use of the government estimates of crop movements.

The Motor Truck and Standardization

Perhaps one of the most difficult problems to solve when the motor truck becomes a common carrier of such crops as potatoes is the standardization of this crop. When potatoes are handled in carlot quantities, and have to be brought to a central shipping point, it is comparatively easy to arrange grading operations which will bring about more or less satisfactory standardization. When, however, trucks are driven to the farms and the potatoes often loaded onto the trucks from the fields where they are dug, it becomes a much more difficult problem to arrange for proper grading of the potatoes. It is becoming increasingly apparent that especially in seasons of heavy production, all potato growers would be better off if the entire crop could be properly graded so that nothing but first class potatoes would reach the market and the consumers.

The erroneous idea which is still in the minds of some growers that the larger percentage of their entire crop they can work off into the channels of trade, no matter what the grade, is one which is doing much harm at the present time. We have not given as much consideration as we should to the influence which the forcing of cull potatoes often mixed with good potatoes onto the market has on consumption of potatoes. A displeased custmer is a liability rather than an asset so far as potato consumption is concerned. We cannot expect the city consumer to be pleased or even satisfied when she is forced to pay good money for potatoes which the grower himself would not think of using on his table.

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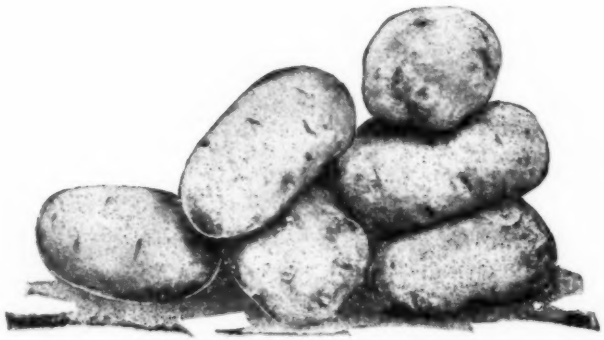

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We do not know how it is going to be possible to standardize the portion of the potato crop handled by motor trucks. Michigan has made a good start in this direction by passing a law requiring that all potatoes be properly labeled when placed on the market. Such a law can only be satisfactorily enforced when public sentiment is back of it. We should endeavor, therefore, to create public sentiment in all potato producing states looking toward the establishment of such laws as may be needed to secure better standardization of the potato crop. When all of the states are able to satisfactorily carry on work of this type, a great advance will have been made in the matter of standardizing the potato crop and thereby making potato growing more profitable to the producer and more satisfactory to the consumer as well as to the distributor.

The Potato Outlook, 1928

By PAUL FROELICH, Bureau of Agricultural Economics, Washington, D. C.

The United States Department of Agriculture issued its official outlook report on Jan. 30. The following statements relate to potatoes:

Present indications are that, unless farmers change their plans, there will be a substantial increase in the acreage planted to potatoes this year. Preliminary reports indicate that farmers in the North Atlantic and North Central states are planning an increase of about 14 per cent and for the country as a whole the probable increase appears to be around 7 per cent. Scattering reports from the south indicate an upward tendency but probably no material increases except possibly in North Carolina and Virginia. In some of the western states, where low prices are now being received, substantial decreases in acreage are to be expected, but the limited number of reports so far received does not indicate that growers are as yet planning on decreases sufficiently radical to offset the increases reported as intended in every state from Maine to Nebraska. If these January intentions are carried out, as they were last year, there seems to be no section of the country where the chances would be in favor of returns from potatoes comparable to those secured during the last three years.

The acreage of potatoes in the United States is becoming steadily more concentrated in the best producing sections and on the farms of those growers who have learned modern methods and who raise an acreage large enough to permit the use of labor-saving machinery for planting, spraying, digging and grading the crop. The quality of potatoes used for seed is also improving at a remarkable rate. This year sufficient certified seed is avail-

able to plant nearly a fifth of the entire acreage of potatoes in the United States, and an even larger proportion of the total acreage will be planted with potatoes grown from carefully selected seed stock. Average yields have been increasing quite rapidly during recent years. Prior to 1920, yields were mostly below 100 bushels per acre, but, with average weather conditions, a yield of about 114 bushels per acre must now be expected. As the increased use of improved seed is also increasing the percentage of the crop that is of marketable quality, it is evident that fewer acres per capita are now required to supply consumptive demands.

Crop Larger Than Needed

In 1927, the yield of potatoes averaged 114.7 bushels per acre and 402,000,000 bushels were harvested. As potatoes in some of the western states are being extensively utilized this season as feed for livestock, it appears that the 1927 production was more than was really needed for human food. If production is further increased this year, the quantity actually marketed may be expected to show little further increase but a greater proportion of the crop will be used for stock feeding, starch, and other low-value purposes.

If there is an increase of 7 per cent in the total plantings of

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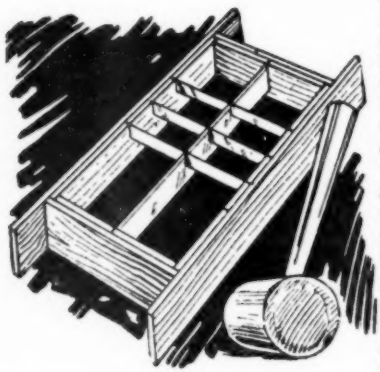

Just a minute, dear friend.—With SMITH'S FAMOUS SEED POTATO CUTTER a person can cut a third more seed than with any other hand or foot cutter, and twice as much as with a knife stuck in a board onto which you push the potato. It will cut eight times more than can be cut by holding the knife in one hand and the potato in the other. With this Seed Potato Cutter the operator can be absolutely sure the seed pieces are of uniform size and that there is an eye in every piece.

There is no reason for you to pay from $25.00 to $125.00 for a seed potato cutter, because here is one at a price within the reach of the smallest producer and it will satisfy the largest operator. Many growers discard more expensive machines and use this one instead, because it permits accuracy in gaging the size of the seed piece and also the speed with which the work can be done. (A bushel in 4-6 minutes.)

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potatoes—as now indicated—the area devoted to this crop would be about 3,750,000 acres. With an average yield of 114 bushels per acre, the crop produced on that area would be around 428,000,000 bushels and would probably bring a repetition of the low prices which prevailed when the crops of 1922 and 1924 were being marketed. Production, of course, will depend largely on weather conditions, but, if 3,750,000 acres of potatoes are planted, there would seem to be nearly three chances out of four that the crop will exceed that of 1927.

The increase of some 30,000,000 bushels of late potatoes in 1927 was due chiefly to heavier plantings in the west. Acreage and production in that section have been gaining more rapidly than is profitable for growers there. Plantings in the Mountain states in 1927 were 50 per cent greater than in 1924, and the Pacific Coast states show an increase of one-third during the same period. Combined production of 80,000,000 bushels in these nine states compares with 49,000,000 bushels in 1924. The ten North Central and Eastern states, which produce a surplus of late potatoes, show more moderate acreage gains during recent years and, in 1927, yields in various important areas were reduced by drought, frost, or blight. In each of these ten states, the number of farmers planning to increase their potato acreages appears to outnumber those planning decreases by at least two to one. Unless there is a more general realization of what this means, there is likely to be a difficult marketing situation in these states next fall.

Various Sections Compared

In the south, there are as yet no indications of a general increase of acreage, though a few states seem to be planning larger plantings. However, the price of late potatoes is lower, the quantity still in storage probably is greater (particularly in the west), and the chances of profit seem hardly as good as they were a year ago.

Some of the intermediate states, especially along the Atlantic seaboard, had exceptionally heavy yields last season, which prolonged their marketing period and slowed down the early market for northern or main-crop potatoes. The chances for a repetition of such exceptional yields are not great, but, even with average yields, if this group materially increases its plantings, there is danger of heavy supply and low prices during the late summer period.

Considering the probability of an increased supply, growers of late potatoes will do well to reconsider their plans for the coming season. Growers who plant heavily should make every effort to hold down their costs per bushel. Those who are planning to expand their potato acreage, because of profits secured during the last three years, should bear in mind the unfavorable returns during the previous three years, 1922-1924.

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Results PROVE the **quick availability of the nitrogen in**

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We'll send you—FREE—enough Arcadian Sulphate of Ammonia to fertilize 25 sq. ft. of soil. We will also send you free bulletins by leading authorities telling how best to use Arcadian. Just fill in the coupon and mail it—today!

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NORTHERN CROP MOVING RAPIDLY; PRICES ADVANCE

(Contribution from the Federal Bureau of Agricultural Economics)

In spite of several periods of zero weather, which tended to hold back potatoes in the north, shipments during late January and early February amounted to fully 19,000 cars and exceeded last year's corresponding record by 2,000 cars. The west has not only caught up with last season's total to date but is now running considerably ahead of the 1927 figure to early February. Movement has been particularly heavy from Idaho, Colorado, Minnesota and Maine.

The volume of good-quality potatoes is being rapidly reduced, and much of the poorer stock is being used for feeding purposes, especially in the west. Many pits of potatoes in the Yakima valley were being sold for stock feeding at $5 per ton. Shrinkage and storage-loss of potatoes has been particularly noticeable in western areas. Local reports indicate nearly 1,000 carloads of potatoes still undug in the Delta region of California. Ordinarily, half of these probably would be saved for seed and the remainder shipped to market, but, with the prevailing low prices, some fields may not be harvested at all and considerable quantities may be plowed under. The San Francisco potato market was demoralized in late January.

Some Bright Spots

Considerable encouragement was felt in eastern and north central producing sections as a result of the upward trend of prices. Western New York shipping points had reached top of $1.95 per 100 pounds and compared very favorably with the price level of a year ago. Top of $1.80 was reported for bulk Green Mountains in northern Maine. Similar though smaller gains occurred in the North Central states, and the Chicago carlot market was in a better position than last month. Green Mountains from Long Island had advanced to $2.50 in New York City. Gains during recent weeks averaged fully 20 cents per 100 pounds. Growers in Colorado and Idaho are elated over the reduced freight rates to points in Texas and Oklahoma, and next season those western shipping sections should be able to compete more successfully in the southwest with arrivals from Minnesota.

Final planting figures for the southern states are still uncertain. Outside the lower Rio Grande valley, the other potato districts of Texas report probable increase of plantings, amounting to as much as 30 per cent in the Eagle Lake-Wharton section. Baldwin County, Alabama, also may have 15 per cent greater potato acreage than last year. Additional reports come in of small increases, and it looks as if growers in the south are taking a chance on the possibility of a spring rise in the price of northern potatoes and a favorable market for their own crops.

The Michigan State Potato Show

By A. G. TOLAAS, Chief Inspector, State Department of Agriculture, St. Paul, Minn.

The largest and best potato show ever sponsored by the Michigan Crop Improvement Association was held during Farmers' Week, Jan. 30 to Feb. 4, at the Michigan State College, East Lansing. Sectional potato shows are held throughout the state during the fall months and the State Show is largely made up of the best samples from these different sectional exhibits. The men in charge of the State Show, and those who have sponsored or have been active in the various sectional shows, are firmly convinced that by this means a great stimulus is given to the growing of better potatoes.

The recent Michigan State Show certainly brought out the fact that Michigan potato growers are interested in potato improvement and the thousands of farmers who saw the exhibit during Farmers' Week have a cause to be proud of their state as a source of first-class potatoes. Not only were the potatoes entered for competition of interest, but the educational features, divided into three categories comprising production, marketing and utiliza-

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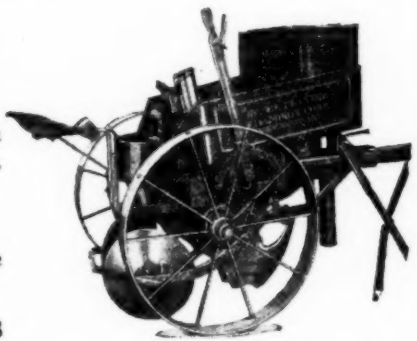

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tion, compelled attention, and one could not help but feel that the authorities contributing to these features were driving home the importance and value of the Michigan potato crop in all its phases.

An exhibit of living plants to show varietal characteristics, diseased plants, charts showing the value of fertilizers, hundreds of names of winners in the potato grading contests, held in all important potato growing sections to drive home the importance of proper grading, were prominently displayed.

Here was a grading exhibit and an exhibit of fancy packs, there in another place were rows of branded sacks showing the various brands under which potatoes are marketed. The Michigan Potato Growers' Exchange and the Michigan Certified Seed Potato Growers' Association, both important factors in the better Potato movement, announced their presence in large attractive signs. Views taken of the seed potato and potato show train on its itinerary throughout the state last spring created considerable interest.

The Home Economics department of the State College had an attractive exhibit showing the value of the potato as food. The culls were not forgotten, and their value, as feed for livestock, was convincingly shown.

The competitive exhibits, and there were more than 300 lots on display, were grouped into Individual Peck entries, County Exhibits consisting of 10 individual peck lots, 60-pound Certified Seed lots, 15-pound lots of Bakers, Boys' and Girls' Club exhibits, and exhibits by boys and girls in the Smith-Hughes school work.

By far the largest number of entries consisted of Russet Rurals. This variety is the most popular one in the state. In the Individual Peck entries there were 63 lots. The growers of this variety are certainly familiar with its characteristics, and, as was to be expected, the competition was especially keen, first place being won by Leon Mankowski of Gaylord.

In the County displays seven counties were represented, Otsego County, in the heart of the Russet Rural section, winning first place. Missaukee, Alpena, Wexford, Cheboygan, and Tuscola Counties placed second to sixth in the order named.

The White Rurals and Irish Cobblers were represented by 17 and 16 entries respectively. Fred VanderMeulen of McBain won first in the Rural class and John Harrison of Manton first in the Cobbler class. In the Green Mountain class John Delongchamp of Champion took first place.

In Class 5, consisting of potatoes of any other variety of merit, Donald Lynch captured first place with a sample of Triumphs, while Emil Rasmussen took second with his Russet Burbanks.

Ed. Sutton of Central Lake had the best 60-pound sample of certified Russet Rurals.

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have an international reputation as the cream of the crop. Assorted cars of any standard varieties you want. Any time, delivered any place.

Most any county agent can tell you about our seed and our service.

A potato demonstration plot is the surest and quickest way to encourage the use of Certified Seed, and many County Agents are taking advantage of our proposition to furnish seed for this work.

We would like to hear from every County Agent who may be interested and also those who find it difficult to secure Certified Seed, because the demand is not sufficient to place carlot orders.

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In the 60-pound certified seed exhibits comprising any other variety, George Harrison of Manton received first place with an exhibit of White Rurals. Other varieties comprising this class were Green Mountains, Irish Cobblers and Russet Burbanks.

The Boys' and Girls' Club exhibits consisted of seven entries, the Hayes Potato Club of Gaylord placing first, Cheboygan and Five Lake Clubs of Alanson and Gaylord placing second and third respectively. In the Boys' and Girls' individual exhibits, Ed. McVannel of Gaylord placed first in the Russet Rural class while Ray Warner of Gaylord placed first in the mixed variety class.

The best peck of baking potatoes was exhibited by Hart Brothers of Quincy. Lloyd Skilton of Gaylord took first with an excellent specimen of the Russet Rural in the single potato entries.

Sweepstakes for the best peck entry of the show was won by Leon Mankowski of Gaylord with his peck of Russet Rurals.

In the Beginners' section, W. H. Green of Gaylord captured first place.

A comprehensive potato machinery display showing the most modern up-to-date types of various kinds of machinery including planters, sprayers, cultivators and diggers, served to round out one of the most comprehensive potato shows it has ever been my privilege to attend.

Taken as a whole, the entire affair was an expression of the most complete and harmonious cooperation of all those interested in the welfare of the potato industry in Michigan.

Pennsylvania Potato Show

By MILES HORST, Secretary Pennsylvania Potato Growers' Association, Harrisburg, Pa.

The annual meeting of the Pennsylvania Potato Growers' Association and the Potato Show, both of which were held in connection with the annual Farm Products Show at Harrisburg, Jan. 17 to 20, were a decided success.

The average attendance at three sessions of the Potato Growers' association was 1,100, and more would have attended but there was not sufficient time. The programs followed at these meetings were of the discussion type. The first session had to do with potato machinery. An open ring was formed in the center of the audience into which the exhibitors of potato machinery brought their machines used in all phases of the industry and were given five minutes' time to explain the merits of their machine and the purpose for which they were best adapted. The

Some very interesting seedling products were shown at the Weld county seed show last week by W. C. Edmundson, Superintendent of the Potato Experiment Station. He displayed a large number of seedlings and only a few recognized varieties.

The seedlings are known by number only and are discarded as they prove unsatisfactory or impracticable. Only when a new variety of special qualities is produced and maintained is it named.

Mr. Edmundson is seeking to develop a potato which will have high quality, produce heavily and mature more thoroughly under northern Colorado conditions.

—LOU D. SWEET.

VERMONT

The average field run yield for Vermont certified seed potatoes in 1927 appears to have been about 300 bushels per acre. This figure is arrived at by a computation of shipping inspection figures as well as from reports by individual growers. An average taken from the shipments of representative growers from various sections of the state who have delivered their entire season's output shows over 220 bushels of graded stock, passing Vermont Certified Seed Grade, for each acre certified.

Fall shipments were badly interrupted by flood conditions, but about 50,000 bushels have been delivered, chiefly to points on Long Island, New Jersey and Virginia.

The shipping inspection service was reorganized and strengthened and a system of cancellation of the tags by the inspectors was adpoted.

—HAROLD L. BAILEY.

Review of Recent Literature

McIntosh, Thos. P.—The Potato: Its History, Varieties, Culture and Diseases, 264 p.—Edinburgh, 1927. This interesting book was written in order to supply a need for a modern work which is adapted to farmers, merchants, students and gardeners who are interested in the potato. The book is divided into five parts as follows: I. Historical. II. Botanical. III. Reproduction and Propagation. IV. Cultivation and Utilization. V. Diseases, Pests and Injury. Part I includes two chapters, the first of which deals with the origin, early history and development of the potato, and the second with a historical note on some potato varieties and breeders. The botanical section (part II) is divided into seven chapters, the first of which discusses the systematic position of the potato with notes on some of the wild

species, the second is devoted to the potato plant, while the third includes the classification of varieties. The fourth, fifth and sixth chapters are devoted respectively to intervarietal differences in foliage, floral organs, and tuber, sprout and stolon parts. In the last chapter of part II the author discusses the maintenance of pure stocks of potato varieties and the rogueing of field crops. Part III embraces five chapters devoted respectively to: Potato breeding and the application of genetics to variety raising; the vegetative propagation of the potato; variation in the potato; quality in seed potatoes; and, further factors influencing the productivity of potato stocks. Part IV consists of three chapters: The cultivation of the potato; the manuring of potato crops; the utilization of the potato crop. Part V is divided in 16 chapters, the first of which is devoted to a general discussion of diseases and the second to degeneration diseases as a class or group, while the next twelve chapters discuss specific diseases of the potato such as late blight, wart disease, blackleg, etc. The last two chapters deal with animal pests, little potato, injury by frost and heat, and hollow heart. Part V is followed by an appendix which contains descriptive notes on some commercial varieties, a glossary and an index. This book should be of interest to all students of the potato. It is published by Oliver and Boyd, Tweedale Court, Edinburgh, Scotland, and is listed at 12½ shillings, approximately $3.05 American money. This price presumably does not apply to foreign purchases.

—W. STUART.

Anonymous—Potato Experiments, 1927 — Government of Northern Ireland Ministry of Agriculture Leaflet 7 (Revised 1927), p. 1-13. The writer of the leaflet states that the principal object of the potato variety tests carried out annually by the ministry is to compare the cropping capacity of new immune varieties with that of old non-immune kinds. Outbreaks of "wart disease" are considered one of the most serious barriers to the development of the potato export trade. The wart disease is described and illustrated. Tests were made at Stormont and at the Northwest Agricultural School at Strabane. In the variety test the investigators used the checker-board system of planting. Descriptive notes are given of 16 of the immune varieties. Sources of seed are given, and the growers are assured that purity and health certificates will be continued in 1928. In rate of planting tests it was found that a spacing of from 12 to 14 inches between plants was more likely to give better yields and a more uniform grade of saleable potatoes than wider distances. Hints are given to growers of potatos on maintenance of purity of potato stocks.

—W. STUART.

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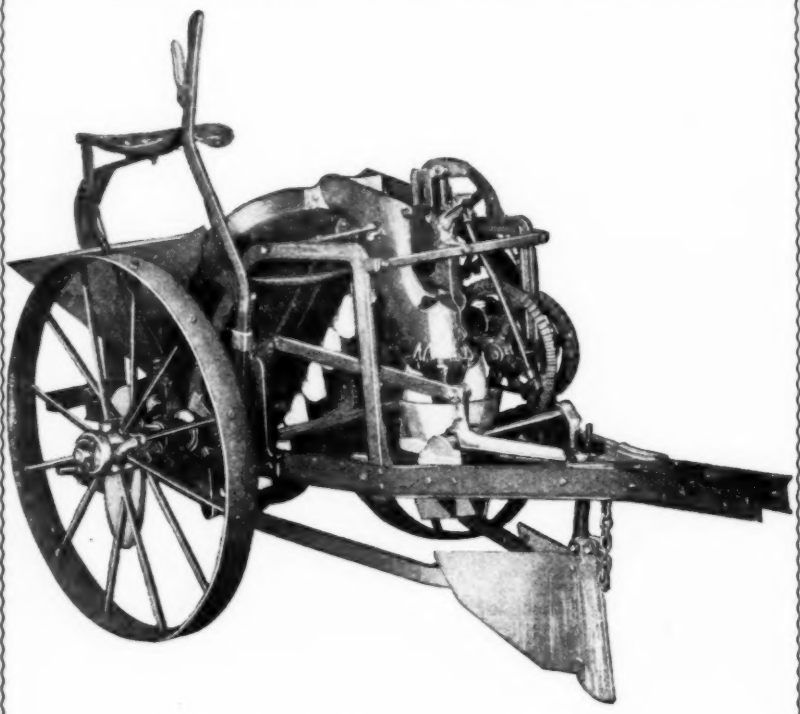

THE value of tuber uniting seed plots and fields to be certified is conceded by every State Department to be the only means which allows of adequate inspection. Read what one group of growers has to say about the Tuber Unit machine used last year: "This planter was bought by six certified seed potato growers and has been used this spring and they are well satisfied with its work." One Minnesota man has used a Tuber Unit machine for three seasons and has practically eliminated disease in his fields. With the Tuber Unit machine the cost of planting on a scientific basis is enough less than the cost of planting in the old way to pay for the machine in one hundred acres from the standpoint of cutting alone. To secure a machine for this season write immediately to

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Seed Potato Treatments for the Control of Scab

By R. W. GOSS and H. O. WERNER, University of Nebraska, Lincoln, Nebraska

During the past five years there has been a growing interest in the use of various chemical treatments for the control of seed-borne diseases. Many and varied experiments have been reported and new treatments have been developed both by pathologists and various commercial companies. Farmers are now spending more for seed treatments than ever before, and as a result they are rightly demanding that the state experiment stations obtain information for them regarding the relative merits of the various seed treatments now being recommended.

This development and use of new seed treatments has been just as marked in the case of potatoes as with other crops. The old standard cold mercuric chloride and formaldehyde treatments were falling into disuse due to the practical disadvantages of the methods and the poor disease control obtained in some parts of the country. The development of the rapid hot solution method of using these chemicals and the introduction of organic mercury treatments by commercial companies has resulted in a renewed use of seed treatments for the control of scab and rhizoctonia. There has been a tendency, however, to assume that because a treatment gave good results for one or more years in a given locality it would produce similar results in all sections of the country. This has not been found to be true in Nebraska at least, as regards a number of treatments for various diseases including those of the potato. It is not the purpose of this dis-

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cussion to go into the reasons for this difference in results but simply to point out that these differences do occur. The matter of seed treatment is often a local one which can only be met by tests conducted by the experiment stations or other disinterested parties under the conditions prevailing in a certain locality.

During the past two years such tests have been conducted in Nebraska with a number of different treatments. The results of only those treatments included in the tests which are being generally recommended and which are available on the market at the present time will be discussed. The tests were made in three different localities with several varities. Since the results for both years were very much the same, only the 1927 tests will be presented. The plot at Lincoln was planted April 16 with Irish Cobblers and is representative of the early crop grown in eastern Nebraska. The plot at North Platte was also planted with Irish Cobblers April 20. It was under irrigation and was not subjected to quite as high temperatures as those occurring at Lincoln during the period of tuber formation. The Alliance plot is representative of the western Nebraska commercial seed and table stock region. It was planted June 7 with Bliss Triumphs.

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Just a minute, dear friend,—With SMITH'S FAMOUS SEED POTATO CUTTER a person can cut a third more seed than with any other hand or foot cutter, and twice as much as with a knife stuck in a board onto which you push the potato. It will cut eight times more than can be cut by holding the knife in one hand and the potato in the other. With this Seed Potato Cutter the operator can be absolutely sure the seed pieces are of uniform size and that there is an eye in every piece.

There is no reason for you to pay from $25.00 to $125.00 for a seed potato cutter, because here is one at a price within the reach of the smallest producer and it will satisfy the largest operator. Many growers discard more expensive machines and use this one instead, because it permits accuracy in gaging the size of the seed piece and also the speed with which the work can be done. (A bushel in 4-6 minutes.)

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Both healthy and scabby potatoes were from the same source, the scabby potatoes having at least three-fourths of the entire surface covered with scab spots. The tests were planned and conducted so as to decrease as much as possible any differences due to either seed or soil and to give accurate comparable data on the effect of the different treatments.

No consistent differences could be noted in the rate of emergence or final stand, nor were there any differences in the vigor of the plants as regards vine growth with any of the treatments listed in the table. The scabby seed untreated produced as good a stand and as vigorous plants as any of the treated lots or as did the scab-free seed in all three plots.

The potatoes produced were all carefully examined and graded according to the amount of scab. The percentages of two of these scab grades are combined as commercially scab-free potatoes and the results are presented in the following table:

RELATIVE MERITS OF VARIOUS SEED POTATO TREATMENTS FOR THE CONTROL OF SCAB

Seed	Treatments (1)	Percentage by weight of scab-free No. 1 size potatoes (2)		
		Alliance	North Platte	Lincoln
		per cent	per cent	per cent
Healthy	Hot formaldehyde, 1 pt. to 15 gal. at 122 deg. F. for 4 min.	82	92	77
Scabby	Hot formaldehyde, 1 pt. to 15 gal. at 122 deg. F. for 4 min.	78	86	92
Healthy	Not treated	56	84	80
Scabby	Mercuric chloride, 4 oz. to 30 gal. for 1½ hour	27	81	66
Scabby	Bayer dip dust, 1-20, instantaneous dip	32	59	48
Scabby	Semesan Bel, 1-10, instantaneous dip	29	67	40
Scabby	Not treated	20	58	40

(1) All treatments were made on whole potatoes except Bayer dip dust and Semesan Bel which were used on seed pieces cut 24 hours before treating.

(2) Scab-free (commercial basis) refers to potatoes with no scab spots visible or with not more than 5 spots 1-8 inch in diameter. These percentages are higher than for potatoes entirely scab-free but the relative differences are the same.

A glance at the table clearly shows the outstanding effectiveness of the hot formaldehyde treatment for the control of scab under the conditions of these tests. The effect of mercuric chloride varied considerably in the three tests, being poorest at Alliance. This result was also obtained in the 1926 tests. It should be noted that the average of the three tests or the results obtained at either Lincoln or North Platte would indicate that this treatment was quite effective, and yet it has failed to control scab to any appreciable extent in the dry land section of western Nebraska. The results with the organic mercury compounds, Semesan Bel and Bayer dip dust, likewise varied in the different tests, but they were both uniformly much less effective than hot formaldehyde and were also less effective than mercuric chloride at Lincoln and North Platte. While it is clearly evident that there was considerable infection from the soil, particularly at Alliance, it must be remembered that the tests were planted under comparable conditions and that these soil differences would not affect the comparative merits of the various treatments.

There were no significant differences in either total yields or percentage of No. 1 size potatoes produced. The scabby seed untreated yielded just as much as the healthy or any of the scabby lots treated. The disease evidently affected only the quality and not the quantity of potatoes produced in these tests.

As a result of these tests, it must be concluded that in Nebraska the organic mercury treatments do not effectively control scab or increase yields, and that mercuric chloride is not an effective treatment in western Nebraska and is not in general as good as hot formaldehyde. The hot formaldehyde method is therefore considered the most effective control for seed-borne scab. The difficulty of using a hot solution is being met in this state by the use of treating machines owned and operated by growers' organizations and by the treatment of carload lots by the wholesale seed dealer.

The results reported here are in general accord with results obtained by growers in the same sections. The necessity for determining locally the relative efficacy of various treatments is clearly apparent. A treatment which has been found to be effective in one section of the country is not necessarily going to yield similar results in other sections.

Irrigated vs. Dry Land Seed Potatoes

By F. M. HARRINGTON, Head, Department of Horticulture, Montana State College, Bozeman

The question of the comparative value of irrigated and dry land seed potatoes is one which constantly appears for discussion. Some sections and some individuals hold that irrigated tubers are valueless for seed purposes; other sections and individuals are willing to accept irrigated seed as quickly as dry land seed, providing they know the disease readings are comparable. Montana Experiment Station has collected evidence along four lines relative to the comparative value of these two types of seed and this evidence points in the direction of indicating equal value of the irrigated with the dry land stock. First, in irrigated sections of the state we find growers of potatoes who have used the same seed stock year after year. We have evidence concerning some of these stocks which shows they have been grown under irrigation for the last twenty years. For the past several years some of this seed has been included in test plots at Bozeman, and a number of the lots have been among the highest yielding in the test. If the application of irrigation water in itself causes a decline in the yielding power of potatoes, a person wonders what some of our irrigated farmers would be producing at the present time with these seed stocks.

Second, during the past seven years, tests of irrigated and dry land seed have been definitely inaugurated and carried, using the same stocks in the beginning, dividing them, and growing them continuously under dry land and irrigated conditions, and also bringing samples from the two plots together each year. Seven lots of potatoes were so divided and handled, and carried without roguing. The two fields in which the lots are carried have approximately the same climatic conditions, being only a few miles apart, but one was a straight out and out dry land field and the other an irrigated plot. This is in a region of high altitude, cool nights, and a more or less low humidity, with the percentage of insect life, particularly aphids, in the fields very low. Results from these seven lots were practically the same. During the period of the test we have had years when the dry land seed has given best results, and perhaps have had it swing in the opposite direction the following season, but the average for the period was so close that a person might almost feel the figures had been juggled.

Third, in connection with tests which have been run in the south the last few years, Montana has included both irrigated and dry land samples in the lots supplied for the work. A recent report coming from a conference at New Orleans states

pointblank that they have no objection to irrigated seed. As a matter of fact, the samples which for a number of seasons gave most phenomenal results in these tests were irrigated samples.

A fourth set of evidence which we have collected during the season of 1927 also bears on this question. We receive samples from every grower of certified seed. These are planted in triplicate plots, with as nearly the same conditions as possible in each plot. During 1927, 34 per cent of the samples included in the test were dry land samples; 66 per cent were irrigated. In the first place we checked against the upper one-third of the lots as to standing and yield to determine the relative place of the irrigated and dry land samples. For the season of 1927, 32 per cent of the lots in the upper one-third were dry land lots, 68 per cent were irrigated lots, the average between the lots being the difference between 19,909 pounds as against 20,130 pounds on the acre basis, practically synonymous. Again, in checking all of the lots that passed field inspections, there was less than 500 pounds difference between the irrigated and dry land seed. As figured from small plots, we can say again, practically synonymous results.

We therefore have evidence in support of the value of irrigated seed, the fact that growers using irrigated seed stock year after year under irrigated conditions are securing top-notch results; that definite test plots, using the same seed stocks in the beginning and carrying them as definite tests of irrigated against dry land seed, have produced about equal results; that the irrigated Bliss Triumph lots sent south have given as good performance as has any dry land stock; and the evidence in our test plots this season with regard to the certified lots.

All four of these point in the same direction, namely, that given equal conditions, except for water, the results are approximately equal.

There is another angle to the irrigated seed, especially from the grower's standpoint. This is mainly the fact that he is regularly going to have a heavier grade-out, due to the fact that the yield always will have a lot of tubers over the accepted commercial seed sizes. This is one of the grower's main problems. Here again the grower will doubtless be up against the proposition of the irrigated field being more moist and more favorable particularly for the development of plant lice, meaning perhaps that he is up against the problem of harder and more consistent roguing.

It is possible in comparing irrigated and dry land seed stocks to get them from certain sections, use different stocks and have marked differences in the results. Given equal disease readings and stocks of equal value in the beginning, the application of irrigation water in the growing of the seed stock does not result in causing that which has received water to become inferior seed.

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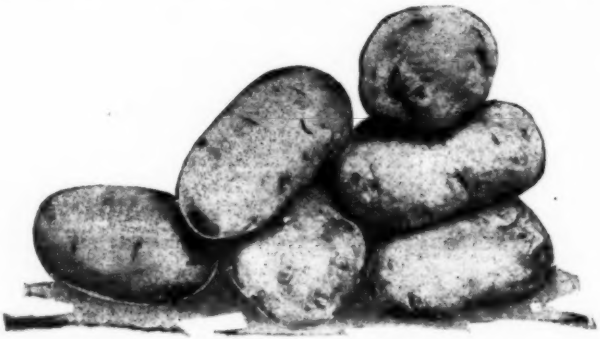

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Correlation Between the Rhizoctonia and the Blackleg Diseases of Potato

By O. H. ELMER, Kansas State Agricultural College, Manhattan, Kan.

Evidence obtained in Kansas in 1927 indicated that late season development of blackleg is correlated with rhizoctonia infection. Near flowering time or later, it was found that a large percentage of the plants in fields where rhizoctonia was severe also had the blackleg disease. Very little blackleg was found at this time in fields where rhizoctonia was under control. In the region between Manhattan and Kansas City, counts were made in numerous fields in which adjacent plots had been planted with untreated seed and with seed treated with different fungicides. It was noted that rhizoctonia was controlled more effectively by certain treatments than by others, but no one treatment was superior in all cases. Usually the hot formaldehyde treatment seemed most efficient in controlling rhizoctonia but in certain instances was less effective than some of the other treatments. In every field it was found that the prevalence of late sason infection with blackleg was correlated with the amount of rhizoctonia that was present and not with the treatment given the seed.

The blackleg disease of potatoes is transmitted both through tubers from diseased plants and through the agency of the seed corn maggot. Growers generally realize the danger of planting seed from fields where blackleg has been prevalent. Experience has indicated that a considerable amount of blackleg develops in the new crop shortly after the plants emerge when seed from such a source is planted. Plants infected from diseased seed usually die before tubers of seed size have been produced.

Blackleg may result from infection transmitted by the seed corn maggot, as this maggot is commonly contaminated with the bacteria that produce the blackleg disease. The adult fly of the seed corn maggot is attracted to seed potatoes in the spring especially when the seed is allowed to lie outdoors in piles. The fly may lay its eggs on these tubers or may deposit them in the soil in the vicinity of planted seed pieces. Upon hatching, the maggots feed on the seed pieces, burrowing through them, and in this process bacteria are inoculated into the seed piece and black-

leg infection results. From the seed piece the disease spreads to the developing shoots.

It is in the spring that the first brood of adults of the seed corn maggot lay their eggs. There are successive generations throughout the season and the later generations of maggots are also potential disseminators of the potato blackleg organism. These maggots eat their way into the stems of growing potato plants and may infect them with blackleg. Plants infected comparatively late in the season may produce a fair crop of tubers before they die. The infection from these plants extends down the stolons and into the tubers where the causal organism may pass through the winter in storage without producing external symptoms of infection. Such diseased potatoes are frequently included in seed stock. Blackleg-infected seed may therefore be produced by plants that do not die before tubers of seed size develop.

The greater amount of blackleg occurring late in the season in rhizoctonia-infected plants seems to be due to the attraction that the decaying tissue in rhizoctonia lesions has for the adult fly of the seed corn maggot. The fly lays its eggs on or near the decaying lesions and the maggots, when they appear, enter the stems carrying the blackleg bacteria with them into the plant. That the fly is not attracted to healthy potato plants was indicated by the fact that very little blackleg was present in fields where the rhizoctonia disease was well controlled. An example may be cited from a field where in adjacent plots potatoes without treatment and after treatment with hot formaldehyde were planted. In July the plants in the untreated plot were generally infected with rhizoctonia and 19 per cent of them were affected with blackleg. In the adjoining plot, the plants from seed treated with hot formaldehyde had very little rhizoctonia, and less than 1 per cent showed blackleg infection.

The problem of controlling the blackleg disease has long engaged the efforts of growers and plant pathologists. Selection of seed stock from disease-free hills has proved of value in reducing early season infection. Coating the seed with poison has possibilities for reducing the amount of tuber infection from the disease-transmitting maggots in the spring.

The blackleg disease causes serious losses both to the producer and to the buyer of potato seed. A certain percentage of infection disqualifies seed from certification. The planting of diseased stock may result in serious loss. It is evident that any measure which will prevent seed infection will be of value alike to the producer and to the buyer.

The correlation of late-season blackleg infection with the prevalence of rhizoctonia indicates that efficient control of rhizoctonia will tend to reduce the amount of blackleg in the seed. Treating potato seed before planting is of great importance for the control of rhizoctonia alone but becomes of even greater importance when blackleg can also be reduced thereby.

Federal-State Shipping Point Inspection in Maine

By G. RAY WARREN, Federal Supervisor, Caribou, Maine

The progress of the federal-state shipping point inspection of potatoes in Maine, when compared with such states as California, Colorado, Idaho and Washington, was not very rapid. Maine was a little slow in accepting the new idea even among the states near or along the Atlantic seaboard. However after a rather inauspicious beginning she bids fair to hold her own in the future.

The slow start is perhaps due to several reasons. The marketing of the crop is in the hands of many different shippers and dealers, who are in turn tied up in various ways financially with the trade. To put over inspection, each shipper or dealer must be convinced inspection will benefit him, whereas the same amount of effort put forth in other producing sections might swing an organization controlling several thousand cars.

During the season of 1922-23, which was the first year inspection was tried out, 384 cars were inspected. No inspection was attempted during the season 1923-24. Only 105 cars were inspected in the season of 1924-25. In the fall of 1925, inspection was really begun in earnest. The state was in a position financially to give inspection a real good chance. During the early part of that season the cost per car was $2.50. The cost was put that low in order to induce more shippers to use the service. About the middle of the year the finances ran low, and after interviews with various prominent users of the service, it was decided to increase the fee to $4 in order to prevent the discontinuance of the work. Instead of inspections decreasing as was expected, they actually increased and at the end of the season 2,073 cars were inspected. Last year conditions were just right for expansion and 5,567 cars were inspected. Owing to the increased usage of the service, the state was able to give a refund of 50 cents a car to shippers, thus making a fee of $3.50 per car.

During the season of 1925-26 the state employed about nine inspectors. Last year the force was increased to 16. The present season began pretty much as it left off the spring before. As many as 21 inspectors have been employed this year during the busy months which are October and November. Up to the present time approximately 4,100 cars have been inspected. This is slightly more than was inspected last year to the same date.

This season is not so good for the inspection work as was last. Usually a large number of Cobbler potatoes are inspected, but on account of the large percentage of hollow heart in them this year, very few have been inspected because it was a foregone conclusion they would not grade U. S. No. 1. Shippers preferred to put them up as best they could and ship without inspection. Again, the shippers' margin of profit has been so small this year that many preferred to risk shipping them without inspection, thus saving the inspection fee.

The first four months of the season of 1925-26, which was the beginning of the first successful season, an average of 10.4% of the cars were out of grade. However, the last five months of the same season an average of 4.4% of the cars were out of grade, which was quite a noticeable improvement. Probably a greater portion of the improvement was due to the instructions in grading given by the inspectors. The following year, or the season from September, 1926, to May, 1927, slightly under 4% of cars were entirely out of grade. So far this season an average of 6.1% cars are not U. S. No. 1 quality. This fact is due to the hollow heart in Cobblers and the prevalence of late blight. However, the past three months showed quite an improvement, with about 3.8% cars out of grade.

An interesting comparison can be made as follows: The season of 1926-27 showed that 1,452 cars from Maine were inspected by the federal inspectors in the large markets in the east. All these cars went out of Maine without inspection but, when inspection was put on them at the receiving market, 55% of them were out of grade. Over the same period, of the 5,567 cars shipping point inspected in Maine, only 4% were out of grade. On examination of figures so far this year the results are practically the same. From the facts as submitted above, the best place to establish the grade is at shipping point and not at receiving point as is done with most stock.

Every potato producing section has its own particular blemishes and defects which lower the quality of the product. About three-fourths of the common defects found in Maine potatoes come under the heading of bruises and cuts. The remainder, such as late blight rot, sunburn, second growth and growth cracks and lastly scab are named in order of importance. Field frost occurs in small amounts some years, but probably is found in smaller amounts than any of the above mentioned defects.

Bruises and cuts come of course through rough and careless handling. These defects are hard to control but can be controlled a great deal more than has been done in the past. The soil in the potato growing section is generally stony, and would naturally cause a small amount of bruising. On the other hand, many potatoes are cut and bruised through failure by the farmer to

take enough dirt while digging, and a failure to properly pad the digger. While picking and hauling to storage houses, a great deal more care could be used than is exercised by most farmers. Consequently, by the time the potatoes are to be shipped to market, many of them are affected with bruises and cuts. Some of these are serious enough to be thrown out of U. S. No. 1 grade. There may be others not so serious but taken as a whole detract from the general appearance of the lot.

Since inspection has been in the state, the inspectors have been constantly talking against bruises and as a result there is a noticeable effort on the part of many dealers and some farmers to take all precautions against bruising. They are doing this by using plenty of power on their diggers, thus taking more dirt which prevents cuts and bruises. The diggers are also padded. The potatoes are dumped into barrels and bins with a great deal of care. Some shippers have their graders padded and fixed so as to reduce bruising to a minimum. The floor at the ends of the graders where the sacks hang are padded and the loaders take precaution not to handle sacks and barrels carelessly.

On the first year of inspection most shippers were content to have a car pass with 5 or 6% grade defects. This year it is more noticeable than ever that many are trying to cut down the percentage on their cars to about 3 or 4%. Some are found showing 1 to 2%. It is all a matter of education. No doubt in four or five years more the quality of potatoes going from Maine will be far better than those shipped out now.

Fertilizer Experiment with Potatoes

By F. C. DEITZ, Head, Department of Horticulture, State Institute of Applied Agriculture, Farmingdale, L. I.

In the spring of 1926, plans were made for a three year fertilizer experiment with potatoes under continuous cropping. The objects of the experiment were two-fold: to study and determine the influence of sulphate of potash on the yield of potatoes and to determine the residual effect of fertilizer under such a system of continuous cropping.

It is the purpose of this article to present a preliminary report based on the data obtained the first two years. Before doing this it is necessary to review the conditions and previous treatment of the soil on which this experiment was conducted.

The soil is a sassafras, gravelly loam. Previous to 1926, general farm crops had been grown on this land, but no crop receiving heavy applications of fertilizer. In the spring of 1926 stable manure was applied at the rate of ten tons per acre. The land

was fitted in the spring of 1926 and again in 1927 in accordance with the best Long Island practice. Certified Green Mountain seed was used and the planting was done early in April.

In 1926 the field was laid out in ten plots and one additional plot was added in 1927. Following is the field plan used in 1927. Each plot was approximately one-sixth of an acre and was planted with ten rows. The rate of fertilizer application was 2000 lbs. per acre.

9	8	7	6	5	4	3	2	1	0
5-10-10	5-10-10	5-10-5	5-10-0	Check	5-10-10	5-10-5	5-10-0	Check	5-10-10
M	S	S			S	S			M

Note: (M) Muriate of Potash. (S) Sulphate of Potash.

The following formula was used in mixing the fertilizer for the plots:

100 lbs.	Nitrate of soda.
150 lbs.	Ammonium sulphate.
100 lbs.	Dried blood.
300 lbs.	Tankage.
1160 lbs.	16% super-phosphate.
0 to 400 lbs	Sulphate of potash.
or	
400 lbs.	Muriate of potash.

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Cultivation and spraying were carried on throughout the growing season in accordance with Long Island practice. There was, of course, a marked difference in vine growth between the check plots and those receiving fertilizer, and the plots receiving complete fertilizer showed most vigor. All plots were harvested September 15, and the tubers were sorted for size and defects into a No. 1 grade and culls. Since it is of value to study the yields for 1927 together with those for 1926, the table below gives the yields for each plot for 1927 and the summary for both years:

POTATO FERTILIZER EXPERIMENT

No. of Plot	Fertilizer Treatment	Yield per Acre in Bushels		
		No. 1 Grade	Culls	Total
0	5-10-10 M	279.20	25.41	304.61
1	Check	111.01	14.52	125.53
2	5-10-0	117.97	22.38	140.35
3	5-10-5 S	229.29	22.08	251.37
4	5-10-10 S	259.84	18.05	277.89
5	Check	91.60	24.50	116.10
6	5-10-0	99.52	21.17	120.69
7	5-10-5 S	286.16	24.50	310.66
8	5-10-10 S	268.31	17.54	285.85
9	5-10-10 M	223.24	21.88	245.12

Summary:

Fertilizer Treatment	Yield per Acre in Bushels				Ave. Total
	1926		1927		
	No. 1 Grade	Culls	No. 1 Grade	Culls	
Check Plots	146.83	22.38	101.31	19.51	145.01
Fertilizer 5-10-0	152.15	39.64	108.28	21.77	160.92
Fertilizer 5-10-5 S	190.57	30.25	252.72	23.29	248.41
Fertilizer 5-10-10 S	258.34	14.25	264.07	17.79	277.22
Fert'lizer 5-10-10 M	.....	.....	251.22	23.64	.....

(M) Muriate of Potash. (S) Sulphate of Potash.

An examination of the yields of the plots under the various fertilizer treatments reveals many interesting results. It should be remembered that the experiment was conducted in 1927 on the same plots as in 1926. First there is a marked reduction in the yield of the check plots and of the plots receiving no potash. This of course suggests the danger in continued growth of the

same crop where no fertilizer is applied. In the case of the plots receiving nitrogen and phosphorus only, the reduction in yield is probably due to lack of potash, the crop in 1926 having largely exhausted the available potash in the soil. The second marked result is the increase in yield of 1927 plots receiving a 5-10-5 S fertilizer, over the 1926 yield. There has apparently been some influence from residue fertilizer used the year before on these plots, since the margin of increase in yield between 5-10-5 S and 5-10-10 S plots in 1927 has been greatly reduced. Comparing the 10 per cent sulphate of potash plot (1926) with the 10 per cent sulphate of potash plot (1927), it is interesting to note that there is a higher average yield for 1927. It should be noted that the plots treated with 5-10-10 M were new to the experiment in 1927. The writer plans to conduct this experiment in 1928 on the same plots and using the same treatments. It is hoped that still more valuable data will be obtained relating to the residual effect of fertilizer after three years of continuous cropping. The results so far indicate clearly the need for potash in producing high yields of potatoes. The 1926 yield indicates that 10 per cent of potash is commercially practical where potatoes are not grown continuously on the same soil.

It will be interesting in 1928 to compare the yields of the 5 per cent potash plots after three years' continuous cropping with the yield of the 10 per cent potash plots under the same conditions.

Crop and Market News

PRICES ADVANCE SHARPLY

(Contribution from Bureau of Agricultural Economics)

Features of the potato situation during late February were the sharp advance of prices and the heavier shipments than a year ago. Markets exhibited unusual strength for this time of the year and were in decided contrast to the weakness of the same period in 1927.

For the first time this season, the price level for eastern and north-central potatoes advanced beyond last year's corresponding values. Western stock shared in the rise and the situation in that region was greatly improved, but the price level for western potatoes was still about one-fourth lower than in 1927.

Wholesale dealers in a few eastern cities got $3 or more per 100 pounds. Northern Round Whites had advanced to top of $2.20 in the Chicago carlot market, and Idaho Russet Burbanks reached $2.40. Eastern and northern shipping point quotations of $1.90 to $2.25 were about 30c higher than a year ago. Holdings in these sections are lighter than last spring, and supplies are fast decreasing. New potatoes from the south are selling somewhat lower than last year, bushel crates from Florida and Cuba bringing $2.50-$4 in terminal markets, with some sales of barrels as high as $14.

The quantity of potatoes held by growers and local dealers in 35 late-potato states on January 1, and available for sale after that date, was estimated to have been 96,625,000 bushels, compared with 84,117,000 last year, 71,344,000 bushels on January 1, 1926, after the very short crop of 1925, and 119,223,000 bushels after the large crop of 1924. Stocks on January 1 this year were about 7% below average January holdings of the five years, 1923-1927.

The 19 northern surplus-producing states apparently had 11,000,000 more bushels remaining on January 1 than they had a year ago. Most of this excess was in the northwestern region. Stocks in the states of Maine, New York, Pennsylvania, Michigan and Wisconsin combined were 38,225,000 bushels, or 8,340,000 less than last year. In the 16 deficient-producing late-potato states, the holdings were only 1,400,000 bushels greater than on January 1, 1927. After deducting the quantity lost by shrinkage and decay or sold for low-value purposes, also the quantities saved for food on the farms where grown and for seed, there were about 247,500,000 bushels either sold or available for sale, out of the total crop produced in 35 late states. This is 19% more than last season, but a large share of this supply had already been shipped or marketed locally by January 1.

Shipments during February were approximately 21,000 cars, or 3,500 more than during the same month last year. The season total to March 1 in the 19 leading states was about 9,000 cars ahead of the record of a year ago, allowing for delayed reports. If as many cars are shipped from now until the end of the season as were marketed after this time in 1927, the final total for these states may exceed 190,000 cars.

Early reports indicated that potato plantings in 10 southern states may be 5% greater than last year—a total of possibly 254,000 acres, which would be the heaviest plantings in five years. Gains are especially noticeable in Alabama, the Carolinas, Virginia, and southern California. Louisiana plantings likely will be greatly decreased. Growers in the 35 main-crop or late-potato states apparently plan to increase their combined acreage by 10% this year, practically all of the increase being in the east and north.

Notes

REPORTS ON CERTIFIED SEED STOCKS

An effort has been made to gather information on the amount of certified seed unsold in the various states. By March 1, reports were received from 14 states; these are presented below. Information on the seed may be obtained by writing the men in charge of the certification work in the various states.

—WM. H. MARTIN.

COLORADO—C. H. Metzger, Fort Collins.

All Triumph seed sold. About 8-10 carloads of Irish Cobblers available.

KENTUCKY—John S. Gardner, Lexington.

About 1500 bushels Irish Cobblers available.

MAINE—E. L. Newdick, Augusta.

Maine has shipped about 45% of its total certified seed production which was 3,278,101 bushels. Certified Cobblers are available only in isolated cases. Some Green Mountains and Spaulding Rose available. Difficult to estimate the quantity on hand.

MONTANA—F. M. Harrington, Bozeman.

Completely sold out on Irish Cobblers, practically sold out on Triumphs, possibly not to exceed a half dozen cars remaining unsold. The Netted Gem or Russet Burbank crop is at least 50 per cent sold. About 35 cars remain unsold.

NEBRASKA—Wm. Morrow, Alliance.

Completely sold out January 1.

NEW YORK—Karl H. Fernow, Ithaca.

Green Mountains, 28,100 bu. Cobblers, 16,600 bu. Smooth Rurals, 13,800 bu. Russet Rurals, 8,200 bu.

OHIO—E. B. Tussing, Columbus.

Entirely sold out.

PENNSYLVANIA—K. W. Lauer, Dept. of Agri., Harrisburg.

Probably less than a carload of certified seed available.

SOUTH DAKOTA—A. W. Palm, Watertown.

All larger lots have been sold.

WASHINGTON—Chas. D. Gaines, Olympia.

Practically all of the early certified seed stock sold on or be-

Guard against HUNGER SIGNS

A POTATO plant should have available for its use ample quantities of a well-balanced fertilizer. Unless it has nitrogen, phosphoric acid, and potash in correct proportions, hunger signs are apt to appear.

When nitrogen is needed, the plant lacks vigor and leaves turn yellow. Delayed maturity is a sign of insufficient phosphoric acid. Potash hunger signs appear in the foliage. The leaves develop a bronzed and yellow color, the leaflets hang limp, and the vines wilt.

Feed your potato plants well and keep them healthy. Don't let them become so starved as to show these signs. Field demonstrations have shown that complete fertilizers containing 80 to 100 pounds of actual potash per acre bring good returns.

On this basis at least 1,000 pounds per acre of a high-analysis, complete fertilizer, containing 8% to 10% potash, or 2,000 pounds per acre, if the potash content is 5%, are required for profitable returns. Where from 8 to 10 tons of manure are used per acre, the above rate of application can be reduced one third.

Our booklet, "Better Potatoes," will be sent you free on request.

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WHEN you buy mixed fertilizers or nitrogen for top-dressing, give these three important points careful consideration:

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Moreover, Arcadian is fine and dry, easy to apply, quickly available, non-leaching—and low in cost per unit of nitrogen. (Arcadian Sulphate of Ammonia contains 25¼% ammonia, 20¾% nitrogen, guaranteed.)

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fore the middle of February. About 50% of the Netted Gem or Burbank Russet remains in the hands of the growers.

MICHIGAN—H. C. Moore, East Lansing.

No Russel Rurals available. About 2,000 bushels of White Rurals for sale.

MINNESOTA—A. G. Tolaas, University Farm, St. Paul.

Certified seed is practically all sold. There are a few cars of Russet Burbank left.

VERMONT—Harold L. Baily, Bradford.

We have approximately 35,000-40,000 bushels of certified seed for sale, about equally divided between Green Mountains and Cobblers.

WISCONSIN—J. G. Milward, University of Wisconsin, Madison.

The following amounts are available for sale: 10,000 bushels Rurals, 1,000 bushels Irish Cobblers, 1,000 bushels Green Mountains and 2,000 bushels Triumphs.

CANADA

There were 31,601 acres of certified seed potatoes entered for inspection in 1927, of which 23,875 acres, or 75.6%, successfully passed the field inspections. This compared with 13,714 acres inspected and 10,392 acres (75.8%) passed in 1926.

The demand for Canadian grown certified seed has again been very satisfactory. The prices obtained so far this season, while not as good as last year, are, nevertheless, considered satisfactory in view of the lower prices obtained for table stock.

Prince Edward Island had by far the largest increase of any province in acreage, and the percentage passed, 80.1, is remarkable in view of this increase. This is felt to be due in no small measure to the energy and painstaking care of S. G. Peppin, the Dominion Senior Inspector at Charlottetown, P. E I., and his inspectors, in applying the official standards and holding strictly to quality as a first consideration.

The Island is very fortunate in having the right type of soil for potatoes, live selling organizations, a good inspection service, and enthusiastic growers. A combination such as this spells continued success to the industry there. The number of new up-to-date storages erected during the past season show that Prince Edward Island is in the business to stay.

Nova Scotia is rapidly coming to the fore in seed potato production. The work of W. K. McCulloch, the district inspector, on tuber unit seed plots for the improvement of foundation stock

has already shown some surprising results. Large shipments of Nova Scotia seed are made to Bermuda and the south, and purchasers have recently stated that they are well satisfied with the improved Nova Scotia seed.

New Brunswick seed is improving. Many growers are now specializing in Bliss Triumphs. C. H. Godwin, the district inspector at Fredericton, encouraged and assisted the laying out of extensive tuber unit seed plots of the Triumph variety. The Bliss Triumph yield in New Brunswick was well over the average of all other varieties, particularly in the seed plots.

The past season has shown that many of the growers are realizing the value of the information communicated and assistance rendered by the inspection service Many new sprayers and dusters of the latest models are to be seen on farms where formerly spraying was done with out-of-date machinery. New potato houses affording better storage and grading facilities indicate that New Brunswick growers are alive to the necessity of producing and shipping better quality potatoes.

The past season was unfavorable to the potato crop, owing to the unusually wet weather prevailing. With improved facilities, New Brunswick will be in the market with fine quality potatoes next season.

—JOHN TUCKER,
Chief Inspector, Seed Potato Certification, Ottawa, Canada.

CALIFORNIA

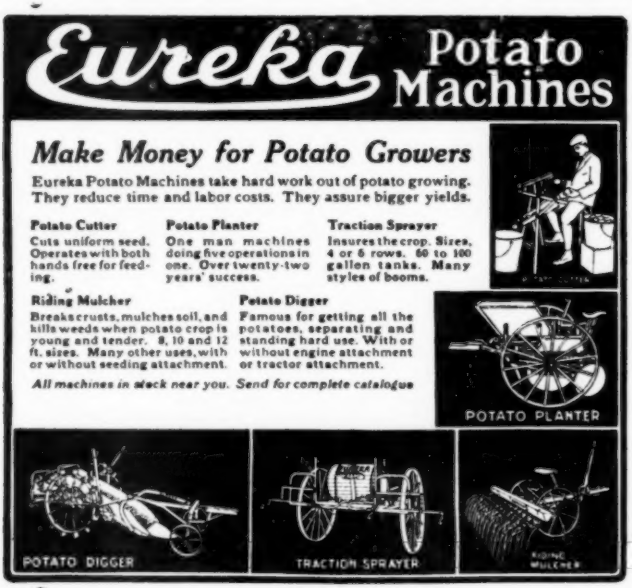
The total acreage and the carlot shipments of California potatoes have tended to decline during the past 10 years. The decline in production is not so marked as the decline in shipments reported, because so many are now being trucked to nearby markets. Thus, southern California grows nearly as many potatoes as ever, but the carlot shipments have dwindled to almost nothing, because the Los Angeles market now takes what used to be shipped to Arizona and Texas. California growers are not discouraged by the apparent over-production of potatoes in the western states last year. The indications are for an increase in acreage in practically every district in the state, except Kern county, which had an abnormally high acreage last year. There have been more inquiries about seed, about varieties, and fertilizers, and such matters, than any time in the past five years.

One notable trend is to be observed in California, and that is to increase the acreage of the early crop. This has increased steadily from 11,000 acres in 1924 to an estimated 19,350 for 1928. This is strictly in line with the economic status of potatoes in California. We have little or no competition on western markets until the early portion of the Idaho crop begins to move

late in July. By that time, the early California crop can be pretty well cleaned up.

The trend in varieties has unmistakably been to replace the Burbank with the Wisconsin Pride, also known as California White Rose and American Giant. The Pride is a long potato, but broader than the Burbank, and much earlier in maturing. It is now used even for the late or main crop in many cases. Furthermore, it is adapted for the two-crops-a-year program, which is of some importance in the central and southern part of the state. A further trend at the present time is to look around for something that may be even earlier than the Pride or White Rose. County Farm Advisor L. V. Taylor is putting on a series of variety tests in the Shafter district this spring, and F. H. Ernst of the Agricultural Extension Service is trying out early varieties as well as sources of seed, in Los Angeles county.

Our tests at the University Farm are quite interesting in this respect. A number of supposedly early varieties are grown each year and small plots of each are harvested at 10-day intervals from the middle of May to early July, all varieties being practically mature by the last digging. Last year, Irish Cobbler was easily in the lead in earliness, producing 11,200 pounds per acre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at the first digging, and 15,600 pounds at the second. Bliss Triumph was almost as productive at these early harvests, however. At the third digging, several varieties were neck and neck, but at the fourth harvest period, White Rose and Earliest of All pulled ahead, with yields of 22,000 pounds each. Rather similar results were obtained in some tests in Los Angeles county, in 1923. Three other varieties that are still used as early croppers in California, namely, American Wonder, British Queen and Garnet Chili, made a very poor showing in our tests, so far as earliness was concerned. A round white potato, such as the Cobbler, is not liked on California markets, so it should be tried with caution, and only where it is intended to sell the crop very early in the season, before the buyers become too discriminating about varieties. The Triumph, however, being a round pink potato, may find a somewhat greater range of usefulness, for it could replace the Garnet Chili, from which the tubers can hardly be distinguished, and which our markets are already accustomed to using during March, April and May.

—J. T. ROSA.

Treat Seed Potatoes With Semesan Bel

SEMESAN BEL is giving potato growers everywhere handsome profits in the form of better quality, heavier yielding potatoes.

J. B. Nix of Eaton, Colorado, who grew 40 acres of potatoes last year, treated three-fourths of his seed with Semesan Bel and says: "My treated seed showed a better stand and more vigorous plants. I expect to continue using Semesan Bel."

W. J. Kennedy of Greeley, Colorado, used Semesan Bel on his Rural Bliss Triumphs last season. He reports: "The Semesan Bel treated seed yielded about 15 sacks more per acre and were of better quality."

Semesan Bel is easy to use. Simply mix it with water, dip your seed potatoes into the mixture, then out again and the job is done. Either whole or cut seed may be treated. Does not harm even sprouted seed.

One pound of Semesan Bel now treats 16 to 20 bushels of seed, twice as much as formerly. At a cost of only 7 to 10 cents per bushel it is probably, labor saving considered, the cheapest potato disinfectant known and certainly the most effective.

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KANSAS

Kaw Valley potato growers intend to increase their acreage slightly this spring. This was indicated at a series of meetings held in the valley during the week of February 14 to 17. At each meeting growers were asked what their intentions were and what they as individuals planned on doing. It was evident from the replies that the valley will increase its acreage to some extent this year. This would suggest about 18,000 acres.

Seed treatment is under way on a considerable number of farms. Doctor Elmer warned growers not to delay seed treatment too long where hot formaldehyde is used. Some seed injury was experienced last year by some of the growers who delayed treatment too long. Several growers are using the organic mercury compounds again this year.

C. E. Graves reports that there is enough certified seed sold in the Kaw Valley this year to plant about one-fourth of the acreage. The spindle tuber disease has increased in importance to such an extent that more interest is being taken in certified seed each year.

A. J. Schoth, assistant state club leader, has organized several potato clubs in cooperation with the county farm agents in the state.

—E. A. STOKDYK.

LOUISIANA

Louisiana's sixth annual potato tour will open with a mass meeting of southern horticulturists and potato growers in New Orleans on Monday, April 16, 1928.

Authorities in the field of southern potato growing will assemble to formulate plans for an all-southern certified seed potato pool. All interests connected in any way with the Irish potato industry of the south are urged to attend this meeting and assist in putting the industry on a safe and more profitable basis.

Following the meeting a four day tour will be made of the principal producing sections of Lafourche, Terrebonne and Iberia parishes where a study of certified seed, disease, insect, and cultural problems will be made at first hand, under the direction of federal and state specialists. Fields planted with certified Triumphs grown in Montana, Nebraska, North Dakota and other seed producing states will be visited. Entertainment features are being planned for the visitors at the various points.

A detailed program of the meeting and tour can be procured from Louisiana State University, Baton Rouge, La.

—G. L. TIEBOUT.

MAINE

The certified seed market is in a very firm condition at the present time. Four dollars and fifty cents is being asked for Cobblers and they are about gone, but Mountain trade is just beginning to call for deliveries and our ten inspectors are very busy. We have already put up around 1800 cars and expect, before the middle of April, to to sell more than 2300. The call for Maine certified seed has been better than usual and we are looking forward to an increased number of applications this year. I have talked with several farmers and can learn of no one who is planning to cut his acreage. We are having wonderful weather for loading.

—E. L. NEWDICK.

NEW YORK

Within the past two weeks the potato outlook has improved materially. At present, western New York growers are receiving from $1.05 to $1.20 per bushel at the car door. Truckmen around Utica are paying up to $1.40 per bushel at the farm. Stocks are being rapidly cleaned out and many estimate that up-state New York will be dependent upon foreign potatoes for its daily supply before many weeks.

Certified seed of all varieties is getting scarce. Stocks are much below normal for this time of the year. Prices range from $2.20 per bushel for Irish Cobblers to $3 per bushel for Rural Russets.

—GEO. WINFIELD LAMB.

VIRGINIA

Today, February 29, was warm and sunny and the potato planters were clicking a merry tune from northern North Carolina to the southern edge of Accomac county. Although the weather has been unseasonably cold and wet the latter part of this month, potato planting has been progressing rapidly. At least one-half of the crop in the Norfolk and lower end of Northampton county has already gone into the ground and by March 10 planting will be practically finished in these two sections. In Accomac county, planting will continue until March 25.

It is too early to give an accurate report as to the acreage to be planted this spring. Reports received to date indicate that there will be a slight increase in the North Carolina, Norfolk, and eastern shore sections over that planted last year. Weather conditions during the growing season have a decidedly greater effect on the total shipments from these sections than does a

small increase or decrease in the area planted. Last year with an acreage slightly below normal, the total shipments were the largest on record. Yields as high as 150 barrels per acre, which are unusual for this section, were reported. Twenty-two thousand cars of potatoes moved from the eastern shore of Virginia and Maryland sections in June, July and August.

Without the stabilizing effect of the price quotation committee of the various selling organizations, a disastrous crash in potato prices would probably have occurred before half the crop was marketed. A number of growers who were unwilling to cooperate last year sold their crop at a figure far below the price quoted by the organization and thereby caused a sharp decline in prices near the end of the season. Indications are that this is not likely to occur this year since 85 per cent of the growers have pledged their intention to abide by the ruling of the committee. This should tend to keep prices at a fair level and prevent excessive dumping on the market when a decline in price is imminent. A large part of the acreage in Accomac county will be planted from Virginia grown second crop seed which does not mature a crop as early as the northern grown seed. This is sometimes an advantage for it allows the southern portion of the eastern shore section to move their crop before the northern section is ready for harvest. Of course this is likely to bring the crop in compe-

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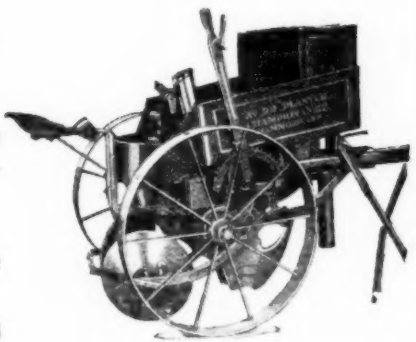

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tition with Maryland and New Jersey, as has occurred in the past.

—H. H. ZIMMERLY.

OHIO

There is a lot of bootleg seed for sale in Ohio this year. The high price of Rural certified seed early in the year made buying slow. Now that the supply is exhausted it makes for ideal bootleg conditions. There is still a large market for seed and the unscrupulous are tagging potatoes with tags that convey the idea that the potatoes have been certified.

The exhaustion of certified Rural seed has also caused heavy buying of Cobblers. It is difficult to prophesy the results of such a movement in face of the large increase predicted in the early sections.

There is a tendency to increase the acreage, especially in the area infested with corn borer, also in the early tobacco region. However, it is not the opinion of the writer that Ohio's total acreage will be materially increased.

—E. B. TUSSING.

PENNSYLVANIA

There is no doubt but that there will be an increase in acreage in this state this year; interest and enthusiasm in potato growing are running high. The sale of potato machinery is greater this spring than it has ever been before; particularly does this hold true of potato sprayers. We are sold on spraying in this state.

—MILES HORST.

Review of Recent Literature

Asseyeva, T. Bud mutations in the potato and their chimerical nature. Jour. Genetics. 19 (1927), No 1, pp. 1-26. Eleven instances are cited of modifications in the potato, considered to be mutations, which have come under the observation of the author. The frequency of the occurrence of these mutations varied in the different varieties. The mutant forms included abnormal leaf characteristics and either gain or loss in color of the flowers and the skin and eyes of the tubers.

By cutting away the external layers of cells of the eyes of the mutants, plants were grown from the deeper layers which were of the normal type, thus indicating that the modifications were confined to the outer layers and were of the nature of periclinal chimeras.

—C. F. CLARK.

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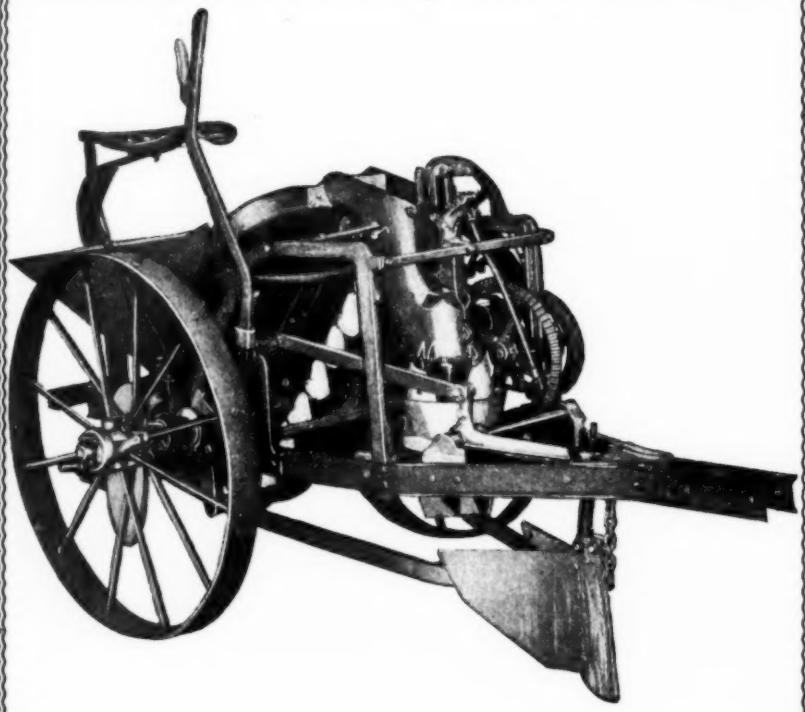

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AMERICAN POTATO JOURNAL

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Potatoes and Soil Acidity

By P. H. WESSELS, L. I. Vegetable Research Farm

Changing soil reaction in order to promote crop growth is an old and well established agricultural practice. Careful adjustment of the soil reaction is not always necessary as many crops will thrive on soils that vary widely in their reactions. So long as a certain degree of acidity or alkalinity is not exceeded, the growth of the crop may be satisfactory. But crops vary in their requirements and when crops with widely different requirements are grown in rotations the adjusting of the reaction of the soil may become an important problem. Such is the case where potatoes are grown extensively and where certain other crops are also of importance as is the case in much of the potato-growing section of Long Island.

In order to obtain information regarding the response of various vegetable crops to variations in soil acidity, a series of sixty-five plots was laid out on the very level fields of the Long Island Vegetable Research Farm in June, 1924. The soil is classed as Sassafras sandy loam. Each plot is thirty-eight feet long and sixteen and one-half feet wide with aisles four feet wide separating the plots, which are arranged in five tiers of thirteen plots each. Differences in soil reaction on these plots were obtained by applying powdered sulphur at the rates of 25, 75, 150, 250, 450 and 800 pounds per acre and hydrated lime at the rates of 300, 750, 1500 and 3000 pounds per acre. One plot in each tier was left without treatment to change the reaction and two plots in each tier received applications of acid phosphate at rates to supply 150 and 300 pounds of P_2O_5 per acre.

Cauliflower was grown on these plots in 1924. In 1925 a green manure crop of oats and field peas was sown. This was plowed

under in June and cauliflower again planted upon these plots. As the reactions had not been changed as much as was desired on the limed plots, another application of hydrated lime was made, using the same amounts as had been applied previously.

In 1926 these plots were planted with Irish Cobbler potatoes. Fertilizer was applied at the rate of 1800 pounds of a 5-8-5 mixture per acre. The planting was done by hand and care was taken to have the number of hills the same on all plots. The rows were spaced thirty-three inches apart and the hills were fifteen inches apart in the row. No differences were noted in the time of coming up or the stand of plants secured, but as the season progressed it was easily seen that growth was depressed on all plots that had received sulphur at the rate of 250 or more pounds per acre; where smaller amounts were used the differences were not marked. The potatoes were dug August 24 after the tops were dead. A careful examination for scab was made but only the merest trace was found. The yields are given in table I.

TABLE I

Relation of Soil Reaction to Yield of Irish Cobbler Potatoes in 1926 (average of 5 replications)

Plot Treatment (lbs. per acre)	Average pH*	Total Yield (bushels per acre)
Sulphur—800	4.7	160
Sulphur—450	4.9	180
Sulphur—250	5.0	204
Sulphur—150	5.1	226
Sulphur— 75	5.2	231
Sulphur— 25	5.3	243
P_2O_5—300	5.3	259
P_2O_5—150	5.3	251
Blank	5.3	236
Hydrated Lime— 600	5.3	242
Hydrated Lime—1500	5.6	260
Hydrated Lime—3000	6.3	242
Hydrated Lime—6000	6.6	239

*Average acidity for the five plots in each treatment. The smaller the number, the more acid the reaction.

The figures in this table indicate that increasing the natural acidity of this soil tends to decrease the yields of potatoes, while decreasing the acidity has no very marked effect.

As we had not obtained the range of reactions desired, another application of sulphur was made, giving each plot one-half the amount applied previously. A cover crop consisting of rye, redtop, timothy, perennial rye grass, alsike clover, medium red clover and hairy vetch was then sown. The object in using such a mixture was to give each plot an opportunity to produce as

much organic matter as the reaction of the soil would permit. There was a good growth of cover crop. On the most acid plots it consisted almost entirely of rye and on the other plots of rye and grasses. Only on the plots that had received hydrated lime at the rates of 3000 and 6000 pounds per acre was there much clover. The hairy vetch did not survive the winter.

This cover crop was plowed under early in April in 1927 and the area planted with the Green Mountain variety of potato. The fertilizing and planting were the same as in 1926. A very uniform stand was obtained and the appearance of the field was much the same as that noted in 1926—a considerable depression in growth on the more acid plots. There was a well graded improvement in growth as the acidity decreased up to the plots which had received the smallest application of sulphur; beyond that there was not much difference in the size of the vines. The plants on the phosphated plots and on the limed plots remained green for several weeks after those on the more heavily sulphured plots were dead. Although spraying with bordeaux mixture was continued as long as the plants remained green, blight was not controlled and the yields were cut by the rot that developed on these plots where growth had continued longest.

The total yields, the amounts of potatoes carrying enough scab to unfit them for market, and the reactions of the plots as determined colorimetrically on the air dried soil are given in table II.

TABLE II

Relation of Soil Reaction to Yield and Quality of Green Mountain Potatoes in 1927 (average of 5 replications)

Plot Treatment (lbs. per acre)	Average pH	Total Yield (bushels per acre)	Scabby (unsalable) (bushels per acre)	Scabby (unsalable) (per cent)
Sulphur—1200	4.6	94	0.1	0.11
Sulphur— 675	4.8	181	0.2	0.11
Sulphur— 375	4.9	248	0.6	0.24
Sulphur— 225	5.1	277	0.1	0.04
Sulphur— 112½	5.4	286	3.9	1.40
Sulphur— 37½	5.4	323	6.9	2.10
P_2O_5—300	5.4	321	2.9	0.90
P_2O_5—150	5.3	324	0.0	0.00
Blank	5.3	296	0.3	0.10
Hydrated lime— 600	5.5	320	2.7	0.84
Hydrated lime—1500	5.7	290	13.0	4.48
Hydrated lime—3000	6.5	259	107.0	41.31
Hydrated lime—6000	6.7	229	162.0	70.74

Not enough data have been obtained to warrant any very decided statements, but it is evident that on this Sassafras sandy loam any increase in acidity beyond pH 5.2 is likely to result in

decreased yields of potatoes. The results with both the early potatoes (Irish Cobblers) in 1926 and with late potatoes (Green Mountains) in 1927 agree on this. The evidence in favor of reducing the natural acidity of this soil for potatoes is not very strong but here we have only one season's results as there was so much rot present in the potatoes on the limed plots in 1927 that the figures do not show the amount of crop actually produced. The question of whether the yield of potatoes can be much increased by liming is a very minor one, however, as compared with the effect that reducing the acidity of the soil may have upon the quality of the crop produced. The evidence here presented shows that with the Irish Cobbler variety of potatoes, on land that had not grown a crop of potatoes for two years, it may be possible to produce one crop of scab-free potatoes where the acidity has been reduced to pH 6.6 through an application of hydrated lime at the rate of 6000 pounds per acre. It would be most unwise to advocate such a procedure on the basis of a single season's work. With the Green Mountain variety, scab was found to some extent on almost every plot, although the amounts were very small where the reaction was more acid than pH 5.3. It is quite possible that the figures for scabby potatoes are too small on the limed plots as it was the opinion of those present at the time of harvest that most of the potatoes that rotted in the field were affected with scab.

Since a reaction around pH 5.5 or 5.6 appears to be approaching the limit for the production of scab-free potatoes of the Green Mountain variety on this soil, it is interesting to note how far this reaction is from ideal for the best growth of some other crops. In an adjoining field where an application of hydrated lime at the rate of 2000 pounds per acre had changed the reaction from pH 5.4 to 6.1, the yield of green peas was increased 8.6 per cent, the growth of peas and vines 13.3 per cent; the total weight of table beets increased 108.7 per cent; the weight of the trimmed beets was increased 135.9 per cent and spinach was increased 139.4 per cent. Cauliflower, which followed these crops, gave an increase of 88 per cent in the number of heads cut where the acidity had been reduced. These figures, which in the case of the beets and spinach would be even more impressive if the acidity had been further reduced, show the need of changing the reaction of this soil for these more sensitive crops and emphasize the difficulty of including any of them in rotations with potatoes.

Maintaining the soil acidity at a point favorable to the production of scab-free potatoes also increases the difficulty of supplying the soil with organic matter. Rye is the principal cover crop used after late potatoes in this section. This will grow well even on land too acid for the best growth of potatoes. The legumes that might be used are limited because of the lateness of the season when they must be sown. Hairy vetch is used to some extent and while it will grow on this soil with a reaction of pH 5.2

it does much better where the reaction is less acid. Where the reaction is much more acid than pH 5.8 it appears to be necessary to inoculate each year, as very few nodules are found the second year even where the roots were well supplied with nodules the previous season.

This experiment has not been running long enough to warrant any very definite recommendations, but it does indicate that it may be desirable to reduce the soil acidity as much as is consistent with the production of scab-free potatoes. Such adjustment must be based upon a knowledge of the soil reaction and of the amounts of lime or other substances needed to bring about fairly definite changes.

Recent Studies on Potato Seed Disinfection

By FREEMAN WEISS, Bureau Plant Industry, U. S. Department of Agriculture, Washington, D. C.

As seed disinfection is a particularly timely subject in the spring, it is proposed to devote the pathology section of several numbers of this journal to presenting brief reports on recent experiments with potato seed treatments so far as the investigators are willing to make public their results and preliminary conclusions. In this series of reports it is aimed to discuss the present status of such questions as the comparative efficiency of the old standard treatments, the hot formaldehyde method, and the new mercury products, in the control of black scurf and scab; also the value of the "insoluble" mercury coatings in the prevention of seed-piece infection from the soil, and their effect on corking-over of cut seed, stimulation of root growth and germination.

No attempt will be made now to summarize the results or to draw conclusions, but these reports can be regarded as the testimony of a number of witnesses whose individual stories are incomplete but whose collective evidence will afford growers about all that is yet known of the subject.

1. GENERAL

Disinfection of seed potatoes was one of the earliest applications of antiseptics to the control of plant diseases, having been introduced in 1890 by borrowing from medical practice the use of bichloride of mercury, and it was first successfully employed

against common scab. Later formaldehyde came to be preferred for this purpose and probably would have replaced the bichloride as a disinfectant for scab, but mercury proved more effective in the control of black scurf and the sprout injury which results from planting infected seed.

Although seed treatment was widely advocated by plant pathologists, and its value was demonstrated in many tests, it was not adopted by growers as a general practice. Some of the reasons for its indifferent reception were the time consumed by the treatments, the general recommendation being for 1½ hours immersion; also the delay in sprouting sometimes caused by seed treatment, or the fear of injury to seed which had sprouted before treatment, and in particular the fact that seed disinfection alone often failed to prevent disease owing to soil infestation. Even the discovery that common scab and in many cases black scurf, so far as they are seed borne, can be controlled by a shorter period of immersion did not bring seed treatment into general use.

The first practical step in that direction was the introduction of the hot formaldehyde method by Melhus in 1922. By this method the time of treatment was shortened to 3 minutes, so that one man could treat two or three hundred bushels a day; and in particular it made posssible community seed-treating arrangements whereby seed is treated in large lots as it is unloaded from the car at some central point, as at a creamery. In this way the cost has been reduced to about 5 cents a bushel, and gains of 20 to 30 bushels per acre have been reported as compared with no treatment. The widespread adoption of the hot formaldehyde method of treating seed potatoes in many communities, particularly in the Middle West, is one of the triumphs of extension pathology.

Another important step has been the introduction of the so-called instantaneous organic mercury treatments, notably Semesan Bel and Bayer Dipdust; more recently still the use of calomel, which is cheap like mercury bichloride, but can be used like the instantaneous organic mercury products, has been shown, in a preliminary test by Blodgett, to have considerable promise.

The introduction of these "insoluble" forms of mercury, which are used in a water suspension like milk of lime, and which form a persistent germicidal coating on the tubers or seed pieces by momentary immersion, has brought up several new problems. The experimental investigation of these questions is still in so early a stage that scientific conclusions regarding them can not yet be expected. Experiments are in progress throughout the country and potato growers and investigators will await the results with interest.

2. POTATO SEED TREATMENTS IN WISCONSIN

By R. E. VAUGHAN, Agricultural Experiment Station, Madison

As a result of previous demonstrations and farmers institute discussions the hot formaldehyde method of seed treatment was extensively used in Wisconsin in 1927. Our records show that over 28,000 bushels of seed were treated. A much smaller quantity of seed was treated with corrosive sublimate. Demonstrations with organic mercury were carried out at the station farm, Spooner, and with farmers in Barron, Langlade and Marinette counties.

Many farmers were highly pleased with the hot formaldehyde treatment and will treat their seed again in 1928 by the same method. Requests for addresses of companies manufacturing hot formaldehyde machines have already been received. Probably more seed will be treated by groups of farmers working with their county agent and their local creameries than with individually owned machines. Some farmers felt that the hot formaldehyde was unnecessarily destructive to seed germination. This was usually traceable to rush work where temperatures were allowed to get beyond the control of the operator. In some cases the poor stands that had at first been attributed to hot formaldehyde were later believed due to excessive wet weather following planting, as an equally poor stand was found with untreated seed. Where a period of a week or ten days intervened between treating and planting, and soil conditions were favorable for growth, there was little report of poor stand.

The limited tests with organic mercury at the Spooner farm showed no value over the untreated seed in Triumph variety where a slight scab infection was present in the soil. No difference in vigor of plants or stand could be detected during the growing season. In the test on Rural in Barron county, no difference could be seen either in the completeness of stand, vigor of plants, or amount of scab or scurf at harvest. In the tests on Triumph in Marinette county and on Cobbler in Langlade county the stand was better where organic mercury treated seed was used than where untreated seed or hot formaldehyde treatment was employed. The vigor of the plants during the growing season was also better. Unfortunately, the weather at harvest time was very rainy and no comparative data was taken.

Further trials with organic mercury are planned for this season. A demonstration will be staged in Barron County where it can be examined at the time of the summer potato tour. Tubers from treated and untreated sections of the plots will be exhibited at the annual roundup and potato show to be held the last week in October at Rice Lake.

3. SEED POTATO DISINFECTION IN IDAHO

By CHAS. W. HUNGERFORD, Agricultural Experiment Station, Moscow

Radical changes have taken place in methods of potato seed treatment during the last ten years. The standard treatments of ten years ago are rapidly being displaced by newer and better methods. The progressive grower should be willing to change his practices from time to time as newer and better methods are introduced. Newer practices, however, should be thoroughly tested and carefully checked, not only in laboratory and field plots, but under actual field conditions, before they are substituted for older methods which have proved successful. Seed treatment, although not a panacea for the control of all the diseases of the potato, is a very important means for the control of rhizoctonia, scab and blackleg. The method of treatment which will accomplish the maximum control of these diseases at the least expenditure of time and money, is the most satisfactory method for use. Although it is desirable, so far as possible, to standardize methods of treatment, it is also true that a method which may be entirely satisfactory in one locality may not be effective in other sections where climatic and other environmental factors may be entirely different. It is very essential, therefore, that tests of diverse methods of potato disease control be carried on in the various states in order to adapt recommendations to local needs. Tests of various methods of potato seed disinfection have been carried on for seven years at the Idaho Agricultural Experiment Station. A brief review of the results of these tests may be of interst.

Early in these investigations it was found that the efficiency, in the control of rhizoctonia, of both the corrosive sublimate and hot formaldehyde methods of treatment, was materially increased by sprinkling the tubers with water 48 hours before treating, and keeping them covered with sacks or a tarpaulin for that period This pre-sprinkling with water also has increased the efficiency of the various other methods of treatment which have been tested. This has been shown not only in the larger amount of rhizoctonia-free tubers which were secured when presprinkling was practiced, but also in planting the sclerotia of rhizoctonia on agar plates after treatment, a larger percentage was always found to have been killed when the tubers were presprinkled and kept moist for 48 hours before treating. No grower can afford to omit this procedure no matter what method of treatment he may use.

Thorough tests have been made of the following materials during the last seven years: Formaldehyde, both hot and cold; corrosive sublimate; furfural; Semesan and Semesan Bel, both as dusts and as dips; copper carbonate; Upsulum and Bayer

Dip Dust; and various other dusts and dips which have not been placed on the market for seed treatment purposes.

As a result of these tests the hot formaldehyde method of treatment has been recommended because it has given year after year the best control of both rhizoctonia and scab. This treatment is rapidly replacing the corrosive sublimate method in Idaho. Unless the organic mercury compounds such as DuPont Semesan Bel and Bayer Dip-Dust are improved so that they become more efficient in disease control and less expensive, I see no reason why Idaho potato growers should not continue to use the hot formaldehyde treatment.

The hot formaldehyde treatment is not difficult to apply. Neither does it require expensive or complicated equipment. Many growers use a hog dipping vat placed over a temporary fireplace dug in the ground. Thirty bushels or more per hour may be treated with this type of equipment. Although it is desirable to keep the temperature fairly constant, no injury has resulted at temperatures slightly above 130° F. for a short time. The best results have been secured when the temperature has been held at about 125° F. for four minutes. The potatoes, in sacks or loose, should be covered with canvas or sacks for one hour after treatment and then be left in a well ventilated room or out-of-doors until the fumes of the formaldehyde have escaped and the tubers are dry.

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G. A. Reed, a Colorado grower, says: "The quick Semesan Bel treatment is what appeals to us farmers, as it is such a saving of time and labor over other methods."

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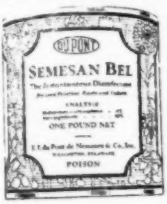

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4. SEED TREATMENT EXPERIMENT IN MICHIGAN

Corrosive Sublimate Gives Best Control of Black Scurf in 1927 Tests

By H. C. MOORE and E. J. WHEELER, Agricultural Experiment Station, East Lansing

Bayer Dip Dust, Semesan Bel and other organic mercury seed disinfectants were compared with corrosive sublimate for control of scab and black scurf. The tests were conducted at Michigan State College and at Lakeview, Montcalm county. The results here given of one season's tests are not regarded as conclusive, but are published at this time in response to numerous inquiries from growers concerning the relative merits of the organic mercury seed treatment compounds.

M. S. C. TESTS

Irish Cobbler potatoes seriously affected with scab and black scurf were divided into 13 lots. Lot No. 1 was not treated and was used to plant the four check plots.

Lot No. 2 was treated with Bayer Dip Dust by the instantaneous dip method. Just previous to planting the uncut seed was dipped into a solution of one pound of Bayer Dip Dust mixed with 20 pints of water. The seed was thoroughly covered with the solution, then taken out and allowed to dry before planting.

Lot No. 3 was treated with Semesan Bel at the rate of one pound of the disinfectant to 20 pints of water, the method of treatment being the same as for lot No. 2.

Lots No. 4 to 12 inclusive were treated with organic mercury compounds furnished by the DuPont Company. These compounds are designated as 12 Bel, 21 Bel and 37 Bel and were used at concentrations of one pound to ten pints, 1-15, 1-20 and 1-30. The method of treatment was the same as for lots No. 2 and 3.

Lot No. 13 was treated with corrosive sublimate, four ounces to thirty gallons of water for thirty minutes. The seed was treated before it was cut and just previous to planting.

The seed was planted June 6 in single row plots 60 feet long replicated twice. The soil was a sandy loam of medium fertility and was evidently infected with scab and black scurf, as all plots showed high percentages of these diseases. Furthermore, an adjacent plot planted with Russet Rural seed apparently free from scab and black scurf was treated with corrosive sublimate and produced seed infected with scab and scurf.

The rainfall for June, July and August was 3.81 inches (5.44 inches below normal), which was not sufficient to produce high yields of Irish Cobblers.

Notes made during the growing season did not show any significant difference between the plots in per cent stand and vigor of plants. The plots were harvested October 25. Yields were recorded and counts were made on percentages of scab and black scurf, the results being given in table I.

Table I. Seed Treatment Experiment, M. S. C., 1927.

Lot No.	Seed Treatment	Clean of scab, per cent by weight	Clean of black scurf, per cent by weight	Yield per acre (bushels)
1	Check (untreated)	25.55	6.81	59.43
2	Bayer Dip Dust	47.30	11.23	53.28
3	Semesan Bel	44.74	15.02	59.44
4	12 Bel (1-10)	42.97	15.73	58.67
5	12 Bel (1-20)	43.03	26.83	61.84
6	12 Bel (1-30)	31.35	12.38	70.49
7	21 Bel (1-15)	58.43	31.50	70.79
8	21 Bel (1-20)	55.93	33.76	71.18
9	21 Bel (1-30)	42.41	34.29	75.31
10	37 Bel (1-10)	32.75	31.28	58.53
11	37 Bel (1-20)	31.80	14.08	63.58
12	37 Bel (1-30)	27.87	18.24	56.07
13	Corrosive Sublimate	49.27	44.49	67.27

LAKEVIEW TEST

The seed treatment experiment at Lakeview was conducted the same as the Michigan State College experiment. An organic mercury compound, 2 Bel, was substituted for 21 Bel, and the 37 Bel (1-30) and 12 Bel (1-30) were omitted.

OK CHAMPION LINE

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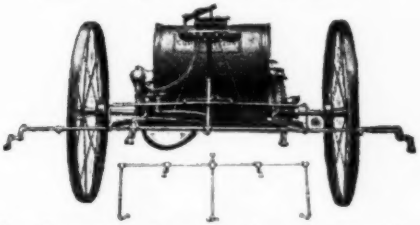
OK Champion 4-Row Sprayer



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The Sprayer comes regularly equipped with pipe arranged for four rows, one nozzle to the row. The same pipe may be arranged to spray two rows, 2 or 3 nozzles to the row, as shown above.

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Russet Rural seed affected with black scurf but apparently free of scab was planted June 15 in single row plots 60 feet long, replicated twice. The soil was a fertile sandy loam. Rainfall during the growing season was approximately 1.17 inches below normal. All plots showed approximately the same per cent of stand and the same relative vigor of vine growth. However, one plot planted with seed treated with 12 Bel (1-15) solution had a number of weak hills which could not be accounted for by the seed treatment.

The plots were harvested October 14 and yields and percentage of potatoes affected with black scurf were calculated. All plots were apparently free of scab, so no counts were made for the percentage of scabby tubers. The results of this test are given in table No. 2.

Table 2. Seed Treatment Experiment, Lakeview, 1927.

Lot No.	Seed Treatment	Clean of black scurf, per cent by weight	Yield per acre (bushels)
1	Check (Untreated)	46.00	144.62
2	Bayer Dip Dust	92.56	151.09
3	Semesan Bel	92.83	145.47
4	12 Bel (1-10)	93.75	156.25
5	12 Bel (1-15)	88.18	131.10
6	2 Bel (1-10)	81.14	158.39
7	2 Bel (1-20)	73.54	156.90
8	2 Bel (1-30)	65.82	153.35
9	37 Bel (1-10)	96.27	156.81
10	37 Bel (1-15)	95.75	157.01
11	Corrosive Sublimate	99.52	144.96

The results of the foregoing tests indicate that corrosive sublimate was fully as effective as Bayer Dip Dust and Semesan Bel in the control of scab and more effective than these two compounds in the control of black scurf. No significant difference was noted in per cent of stand, vigor of plants or yield between the corrosive sublimate plots and those treated with Bayer Dip Dust and Semesan Bel.

None of the other organic mercury treatments were as effective in the control of black scurf as the corrosive sublimate and only two, 21 Bel (1-15) and 21 Bel (1-20) showed as satisfactory control of scab as did the corrosive sublimate.

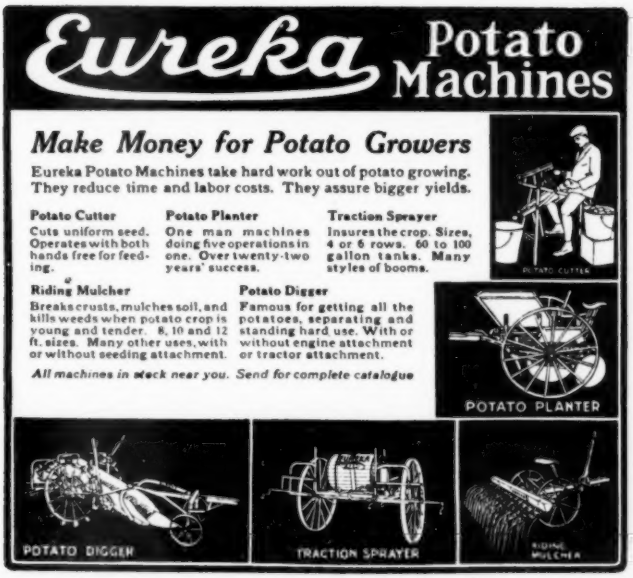
While some of the organic mercury treatments gave better yields than the corrosive sublimate, yet the difference in yield is of little significance. In the Michigan State College tests the average yield per acre of the 11 organic mercury treatments was 63.38 bushels or 3.89 bushels less than the corrosive sublimate plots. In the Lakeview tests the average yield per acre of the 9 organic mercury treatments was 151.82 bushels or 6.86 bushels more than the corrosive sublimate treatment.

Further experimental work is necessary before definite conclusions can be drawn or recommendations made. The 1927 tests indicate, however, that Michigan growers are not yet warranted in substituting organic mercury compounds for corrosive sublimate in the control of black scurf. In Michigan black scurf is more serious than scab in causing losses to the potato crop.

Higher Analysis Fertilizers Are Coming

By H. R. TALMADGE, Riverhead, Long Island

Exclusive of land rent, it cost the Long Island farmer $140 per acre to grow his potatoes in 1927. Of this amount 22 per cent was for fertilizer. About a ton to the acre is used and that is probably about the amount used by potato growers all along the Atlantic seaboard, from Florida to Maine. These potatoes grown with fertilizer have to compete in the markets of the country with potatoes grown farther west, without any such quantity of fertilizer. To many markets this added cost for fertilizer is much more than the difference in freight. Anything that will reduce this fertilizer bill will be welcomed by the eastern potato grower.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Make Money for Potato Growers
Eureka Potato Machines take hard work out of potato growing. They reduce time and labor costs. They assure bigger yields.
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Cuts uniform seed. Operates with both hands free for feeding.
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One man machines doing five operations in one. Over twenty-two years' success.
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Breaks crusts, mulches soil, and kills weeds when potato crop is young and tender. 8, 10 and 12 ft. sizes. Many other uses, with or without seeding attachment.
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Famous for getting all the potatoes, separating and standing hard use. With or without engine attachment or tractor attachment.
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Many Successful Potato Growers use Eureka Two-Row Fertilizer Distributors and Eureka Two-Row Potato Planters

EUREKA MOWER CO. Utica, N. Y.

For many years a very large part of the ammonia that went into fertilizer was obtained from by-products from other industries. Very large amounts of fish scrap, tankage and cotton seed meal were used in fertilizers. Now these materials are largely used for feeds, at a price which the fertilizer manufacturer cannot afford to pay.

Fortunately, processes have been found to extract nitrogen from the air. As a result, many different forms of fertilizer salts are available in large and rapidly increasing quantities. The unlimited source of supply of nitrogen and the improved methods of extracting it from the atmosphere are steadily reducing the price of this most expensive element in fertilizers.

For many years low-grade fertilizers have been the big sellers, because the price was low. It is quite evident that price per ton rather than value per ton has been the governing factor in selling the farmers their fertilizer . This has been the fault of the fertilizer companies, who have given their salesmen the wrong point of attack. In recent years the fertilizer companies, cooperating with the Experiment Stations and other agencies, have eliminated some of the low-grade brands.

In some states it has been necessary to pass laws forbidding the sale of these low-grade fertilizers. If the fertilizer salesmen had educated their customers properly there should be no need of any such legislation.

THE EXTRA BUSHELS MAKE THE PROFIT

With V-C Fertilizers you not only get larger yields of Potatoes per acre—but the tubers will be smoother and more uniform in size.

V-C Brands for Potatoes carry that blend of plant food that insures an early start, rapid growth, full development and prompt maturity.

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With the materials that have been available in the past, it has not been practical to produce large amounts of fertilizers with much over 20 pounds of plant food per hundred pounds of mixed fertilizer. The goods have been sold on the basis of dollars per ton, rather than on the basis of quality and amount of available plant food per ton. In the lower grades, the salesman never told his customer that there was two hundred pounds or more of sand or other inert material as a filler. Of course the fertilizer salesman always denied there was any filler in his brand of fertilizer. The farmer would not pay out his good money for filler if he knew he was getting it. The average farmer thinks a ton of fertilizer is a ton of fertilizer and it will take a lot of hard work to show him that he can get a ton of fertilizer that contains as much real plant food value as two tons of the old low-grade goods.

These new sources of ammonia, produced from air-derived nitrogen, are high in analysis. Some of them run up above 50 per cent of ammonia. In addition to these materials high in ammonia, processes have been worked out whereby phosphoric acid and potash have been combined with this synthetic ammonia and fertilizers are now on the market that contain over 60 per cent of available plant food.

These new materials have been tested extensively on various crops, alongside of the older brands of fertilizers, and have genrally proven to be equally as good, although considerable care needs to be taken in connection with their application. Such mixtures should be well mixed with the soil before or at planting time.

Some of the complete synthetic mixtures now on the market are complete fertilizers, one ton of which contains about the same amount of plant food as three tons of a 5-10-5. It is of course a very concentrated mixture. In just what form it will prove practical to use it still remains to be learned by experience. The existing potato machinery was designed to handle more bulky fertilizers than these materials. It is doubtful if they can be handled in these machines without some changes. It is probable that these new high grade materials will be used in mixtures, along with some of the materials that are now being used in the ordinary mixtures on the market. Mixtures containing 40 per cent plant food can be made in this way, giving a fertilizer, a thousand pounds of which would contain as much plant food as in one ton of ordinary mixture now being used. By using such "doubte strength" fertilizers it will effect a cash saving of at least 10% and in addition will make only half as many tons of material to haul, store and apply. These "double-strength" fertilizers save money, save labor and give equally as good crops as the present brands. Why should they not come quickly?

Crop and Market News

(Contribution from Bureau of Agricultural Economics)

SPRING HOLDINGS ESTIMATED

Official reports as of March 1 showed 107,643,000 bushels of old potatoes still on hand, including seed stock and supplies reserved for food on farms. On March 1 last year, estimated stocks were 86,626,000 bushels; two years ago 68,709,000, and three years ago 131,088,000. Of the 1928 supplies in March, the 19 surplus-producing states had about 88,000,000 bushels, or 18,000,000 more than a year ago. The 16 deficient-producing late-potato states had 17,000,000 bushels, compared with 14,000,000 last season. Potato stocks on March 1 were reported to be less than last year in the important northern states east of Minnesota, but substantially heavier than a year ago from Minnesota westward. About 6,000,000 bushels of the total 21,000,000 excess over 1927 represent increased holdings for seed purposes. The quantity reserved for food on farms where grown is also believed to be larger than the amount so held last year. Carlot shipments during March were at least 3,000 or 4,000 cars heavier than those of March, 1927. This greater carlot movement used up no less than 2,000,000 bushels of the excess.

New potatoes have been delayed by unfavorable weather and total output may not be so heavy as the increased acreage would indicate. If further delay occurs and if production is materially reduced from original prospects, the remaining supplies of old stock may yet get wide distribution. By April 1, the daily movement of southern potatoes had increased to about 20 cars, compared with 70 at the same time last year. Southern Texas was forwarding three cars to every car from Florida, but the main shipping district around Hastings, Florida, was expected to be active very soon.

Eight second-early states, shipping largely after mid-June, have an indicated commercial potato acreage 13% greater than last season. Their combined plantings may be 106,000 acres. Plantings in Arkansas may be double those of 1927; Oklahoma may increase its acreage by one-third, and New Jersey expects fully 31,500 acres. Other important mid-season states show little change from 1927, though there is a tendency to increase plantings in most sections.

1928 POTATO PROSPECTS

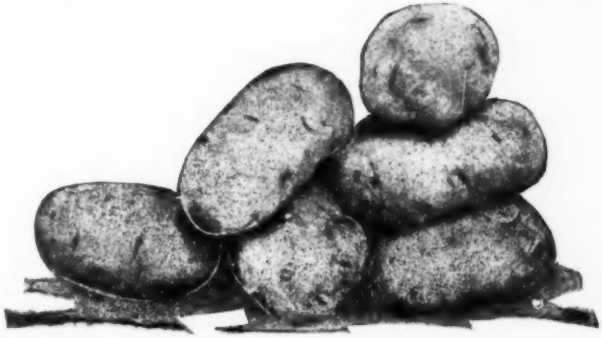
The March 1 report of growers' intentions to plant potatoes indicated a probable increase to 3,923,000 acres in the United States this year. These March intentions, if carried out, would, under average conditions, result in a production of around 435,000,000 bushels or about 3.6 bushels per capita. Such a production could hardly fail to bring about less favorable market

POTATO DISEASES

Prevented by use of

Mallinckrodt

CORROSIVE SUBLIMATE



Avoid crop losses from Common Scab, Black Scurf, Blackleg and other diseases by treating your seed potatoes according to directions in our Circular, which will be sent on request.

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You'll find Arcadian a fast worker. It contains 25¼ per cent ammonia guaranteed (415 lbs. of nitrogen in every ton). Fine and dry and easy to spread. Apply the sample as directed and check up on the results.

Helpful bulletins—also free

When you send for your sample, mention what crop or crops you raise. We'll send you free bulletin telling you how to increase those crops. These bulletins are the work of noted authorities—they're brimful of sound information for farmers, vegetable growers and fruit growers.

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conditions, perhaps as unfavorable as prevailed during the marketing of the 1922, 1923 and 1924 crops. The total potato crop last year was about 402,000,000 bushels; that of 1924 was nearly 422,000,000 and the 1922 production amounted to 453,000,000 bushels.

In the northern states east of the Mississippi River, growers show intentions to increase the acreage about 11% and, with average weather conditions, yields per acre may be expected to be about 8% higher than last season when the weather was quite unfavorable in most of the states of this group. The combination of these two possibilities would increase production about 20% in these states. The yield per acre in most states west of the Mississippi is not likely to average as heavy as it was last season, but the intended increases of acreage in eastern states, with average growing conditions, are likely to make marketing of western potatoes more difficult next fall. Western growers, planning to increase production, must, therefore, do so with the prospect of reduced returns, due either to lower market prices under heavier competition or to the increased use of potatoes for stock feeding.

The detailed report of intentions to plant potatoes shows about 10% increase in the North Atlantic states as a group. Pennsylvania and New York have larger percentage increases than other states in the northeast. The North Central region expects a gain of nearly 14%, with heavy increases in some of the important commercial areas. South Atlantic states, from Delaware to Florida, show a probable increase of 12% in total potato acreage, and the South Central group may have 15% more than last year. Western states expect a smaller gain than any other region—only 7%. Washington, California and Utah report intentions to reduce their potato acreage by 5% to 8%, but this combined decrease is more than offset by proposed increases in other western states.

CERTIFIED SEED PRODUCTION

Bearing directly on the question of potato acreage and production is the quantity of certified seed stock produced last year. The total 1927 crop of certified seed in 20 important states is estimated at nearly 7,000,000 bushels. This is 40% greater than the 1926 crop, 60% above the 1925 figure, but about 7% less than the record production of 1924. Maine is credited with almost 3,300,000 bushels, Idaho with 866,000, Minnesota with 622,000 and several other states with 250,000 to 325,000 bushels each. Prices to growers averaged about 75c per bushel less than the year before. Cobbler and Green Mountain were the leading varieties grown, these two accounting for more than half of the total certified crop. Next varieties in order of importance were Netted Gem, Triumph, Spaulding Rose, and Russet Rural.

Special Potato Fertilizers

A high analysis fertilizer is now available for fertilizing potatoes

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15% Nitrogen, 30% Phosphoric Acid and 15% Potash. Owing to the high analysis, only comparatively small quantities are needed.

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46% Nitrogen=55.9% Ammonia. Pure organic plant food. In seven year tests it has given best results as a nitrogen carrier for potatoes.

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Ammonium Sulphate Nitrate

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Our soil scientists and fertilizer specialists will help you with your fertilizer problems.

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Notes

CANADA

The total production of certified seed potatoes during 1927 amounted to well over 4,250,000 bushels. The demand has been exceptionally good, and the crop is about cleaned up, with the exception of a few cars of Cobblers and Mountains in the eastern provinces, a few cars of Rurals in Ontario, and smaller quantities of other varieties in the west.

The yield of potatoes in Canada averaged about eight and one-half bushels per capita in 1927. In the province of Prince Edward Island the yield averaged about 80 bushels per capita.

The prospects for 1928 are that more potatoes will be produced than in 1927. More growers have obtained certified seed; more fertilizers, more materials for treating seed and for spraying, have been ordered than ever before. We judge the acreage will be increased 10% or more.

A 20% or more increase is expected in the acreage entered for field inspection with a view to certification. All applications must be received not later than June 15 this season, or they will not be listed for inspection. —JOHN TUCKER.

NEW BRUNSWICK, CANADA

The quantity of certified seed potatoes shipped out during the fall and winter months was considerably in excess of that exported during the same period of the previous year.

Approximately 100,000 bushels of seed were disposed of, in addition to twenty-five cars of Green Mountains, twenty cars of Irish Cobblers, and seven of Bliss Triumph, exported to distant points. Cuba and North Carolina increased their demand for Irish Cobblers about 100 per cent, while Florida took all the certified Bliss Triumphs.

Approximately 75,000 bushels, all varieties, have been shipped out to date this spring, to Ontario, Quebec, and for export.

—C. H. GODWIN.

PRINCE EDWARD ISLAND, CANADA

Approximately 19,915 acres were passed for certification in 1927, of which 16,018 acres were Irish Cobblers, and 3,857 Green Mountains, all other varieties 40 acres.

A study of the figures on acreage entered per individual grower reveals the fact that 65% planted less than 5 acres each; 25% planted over 5, and under 10 acres; 9% planted over 10, and less than 20 acres; and 1% over 20 acres, to seed potatoes.

The spring shipping season is about concluded. The demand for seed was excellent, and altogether the past year might be considered a very satisfactory one for the potato growers of this province. —J. T.

COLORADO

A Record Yield

Fred Speiser of Monte Vista, Colo., is the potato king of the San Luis valley. He grew twenty-five tons of potatoes on an acre, or in the language of the San Luis Valley potato growers, this yield of 833.2 bushels would mean 457 field sacks per acre, even more than a big refrigerator car would hold.

A legume crop to build up the soil, good seed and good farming is the simple story of Mr. Speiser in explaining how it was done. Of course, the natural potato climate and deep valley loam of this high mountain valley, as large as the state of Massachusett,s must be given due credit. Mr. Speiser was crowned "king" at the Annual Valley Seed Show as winner of a potato growing contest, sponsored by the Rio Grande County Farm Bureau.

Mr. Speiser hand-selected his seed in the cellar last winter, picking true type Peachblow seed of larger than usual size. It is the custom of growers in the San Luis Valley to plant small whole seed at the rate of about 1000 lbs. per acre, but due to larger size of the seed potatoes selected, Mr. Speiser planted at the rate of 1600 lbs. per acre. No seed treatment was thought necessary and the seed potatoes were planted in rows 34 inches apart with 14 inches between hills Mr. Speiser was careful to see that the planter cups contained seed at all times to insure a good stand.

This enormous yield of potatoes followed a crop of San Luis Valley field peas which were hogged off, leaving a heavy mat of vines. Some growers declare that the pea vines are troublesome and proceed to rake and burn them before plowing for potatoes. Mr. Speiser reasons that the crop of potatoes needs air for proper growth and, especially in an irrigated country where the soil is apt to run together following an irrigation, there should be plenty of organic matter to keep it loose. Twelve inches is the proper depth to plow for potatoes, especially when a mat of dry pea vines is to be turned under. A tractor supplies plenty of power for plowing which is usually done in April. Immediately following the plow a harrow and drag are used and the field is ready to plant.

Just as the potato plants begin to appear, the cultivator is brought in and the row is covered up by a deep cultivation. After about 10 days the field is harrowed and there is no chance for young weeds to escape. Two cultivations, two irigations, digging, picking, sorting and sacking in the field, puts the crop ready for shipment, provided the price is right. If the manager of the potato exchange suggests that too many potatoes are going to market at digging time, San Luis Valley growers fill their enormous adobe cellars, watch the market and await instructions.

—T. G. STEWART.

CALIFORNIA

Another Record Yield

World's record-breaking crops of potatoes were produced in 1924 by Fred Rindge, and in 1926 by Zuckerman Brothers, of Stockton, Calif. In both cases the yield was slightly over a thousand bushels to the measured acre. In both cases the news of these big crops has been heralded to the four corners of the earth, and has attracted no end of favorable attention to be focused on the possibilities of the peat-land section around Stockton. Now a third record-breaker is reported for 1927 crop, this being a yield of 1078 bushels to the acre, again obtained by Fred Rindge. This shows that the big crops reported before were not flukes nor accidents due to a particularly good growing season. Crops of over 1000 bushels per acre in three years out of four indicates pretty consistent performance. The record in 1924 was made on the Burbank variety, in 1926 on the Wisconsin Pride, and in 1927 on the British Queen variety.

Many letters come to the writer, asking the secret of these heavy potato crops. Aside from the skill and intelligence of the grower, the main factors may be set down as follows: (1) Heavy fertilization—one ton or more to the acre of 0-21-24 fertilizer. (2) Close planting—9 x 28 inches apart. (3) Heavy seeding—30 to 42 bushels of seed per acre. (4) Continuous optimum moisture supply through sub-irrigation. (5) Long growing season—150 to 160 days. (6) Absence of insects and diseases. Of the common fungus diseases, only rhizoctonia is serious, and this is to a large extent controlled by seed treatment. Spraying is not necessary in the Stockton district. Nearly every eastern potato grower is familiar with the facts set forth above, but not many of them have the courage to use 40 bushels of seed for a commercial crop, nor to use so much fertilizer. And with his limitations of soil and climate, the eastern grower in the great majority of cases is probably wiser not to go quite to these extremes. However, as Herbert Zuckerman says, we expect to surpass present records by quite a good deal, when we know more about the fundamentals of potato production.

—J. T. ROSA.

NEW YORK

The Empire State Potato Club was organized in February during Farm and Home Week at Cornell. The purpose is to promote lower cost of production through more efficient cultural practices, to improve the market quality of New York potatoes, and to provide a closer tie-up of potato growers throughout the state.

This is not a 400 Bushel Club and the plan does not involve in any way a definite stipulation as to minimum yield requirement. The club is being sponsored by the New York State Vegetable

Growers' Association. Its annual meeting and exhibit will be held in connection with the state convention of that organization at Utica next January.

Qualifications for membership require cost of production and yield records based upon a regularly shaped area of three continuous acres of a single variety. A representative five-bushel field run sample will be collected from each plot and will be graded by an authorized agent of the State Department of Agriculture and Markets.

Premier membership will be awarded a certain percentage of the contestants rating highest on the basis of the following score card:

Cost of production per bushel	50 per cent
Yield per acre of U. S. No. 1 Grade	40 per cent
Total yield per acre, field run	10 per cent

Each contestant is required to exhibit a 150 pound sacked sample graded U. S. No. 1 or better from his contest area at the Potato Show held in connection with the Annual Convention of the New York State Vegetable Growers' Association. These samples will compete for premiums on the basis of an exhibition score card.

Detailed information on the Empire State Potato Club may be procured from the Department of Vegetable Gardening, Cornell University, Ithaca, New York. —E. V. HARDENBURG.

New York state will plant an increase of 10 per cent or more over 1927 acreage. Cabbage has been very unprofitable for last two years and many will shift to potatoes. Upstate New York has sold potatoes of the 1927 crop very largely to city trucks at prices higher than carload shippers could afford to pay, owing to the local shortage general through central and eastern New York. Remaining supplies on hand April 1 are much lighter than either 1925 or 1926 crops at same date. Carload shipments after April 1 will be light, account truck competition.

—DANIEL DEAN.

According to the best reports available today, April 4, there are left unsold in the state not over 10 cars of Certified Green Mountains, 11 cars of Irish Cobblers, 6 cars of Smooth Rurals and 3 cars of Rural Russets. This is a very small supply for this date. Everything points toward a complete cleanup, heavy plantings, and with a normal growing season, cheap potatoes in the fall. —GEO. WINFIELD LAMB.

MISSISSIPPI

New Potato Rule Announced

A new regulation announced by the State Plant Board of Mississippi is of special interest to all wholesale and retail

grocers, seed dealers, and farmers who buy or sell seed Irish potatoes in Mississippi. The new ruling prohibits the use of the term "Certified" in regard to Irish potatoes in Mississippi except when the potatoes have been inspected and certified by the proper state officials where they were grown. It is very comprehensive, as it applies not only to the tags and labels on such potatoes, but also to oral or written statements or advertising in regard to Irish potatoes.

According to the Plant Board, the new rule is designed to protect the buyers of seed Irish potatoes in Mississippi, hundreds of whom have been confused and deceived during the past two years by the fact that so-called "privately-certified" seed potatoes have been sold as "state-certified" seed. In most cases, the state-certified seed must pass two to three field inspections and one bin inspection and come up to certain prescribed standards before they are certified, while the "privately-certified" seed have no definite standards in regard to quality and freedom from disease.

The new regulation will become effective July 1, 1928, in order that all grocers and seed dealers may have ample time to become familiar with its provisions before placing their orders for seed potatoes next season. This rule does not prevent the sale of any kinds of potatoes, but merely provides that the term "certified" must not be used except in regard to "state-certified" seed. The rule in full is as follows:

"In order to discourage the introduction into and the dissemination within Mississippi of mosaic, scab, leafroll, spindle tuber, late blight, wilt, wart, and other diseases of Irish potatoes, the use of the terms 'certified,' 'inspected,' 'registered,' or any other terms conveying a meaning substantially equivalent to these terms, either orally or in writing, or in advertising in reference to such potatoes, or on the labels or containers thereof, is hereby pohibited, except when such potatoes shall have been inspected and certified by the legally constituted inspection officials of the state in which they were grown, or by such other agencies as may be approved by the State Plant Board of Mississippi."

—CLAY LYLE, General Inspector.

KENTUCKY

The spring-planted acreage is increased about 15 per cent over last year. The average planting date was two weeks earlier than in 1927. There has been a marked increase in acreage planted with certified seed. In fact, the available seed supply was exhausted March 15, before more than 75 per cent of the market was supplied. The certified seed growers' associations are 95 per cent sold out (April 1) with 15 days of planting time remaining.

—JOHN S. GARDNER.

VIRGINIA

The old saying "No news is good news" will probably apply to the potato situation in eastern Virginia this month. Fewer reports of rotted seed have come to the attention of the Station this year than usual. It is a little early to make any definite prediction regarding the stand of potatoes which will be secured but all indications are that it will be exceptionally good this season. Warm weather during the past ten days has greatly advanced the growth of the sprouts which will be ready to burst through the soil within a few days in lower Northampton County and on the sandy areas around Norfolk. The latest reports regarding the acreage planted indicate that there has been a 10 to 15 per cent increase in total acreage on the Eastern Shore and probably about 10 per cent increase in the Norfolk section. Because of the low price of sweet potatoes during the past year, many of the growers in Accomac County have decided to substitute a part of the regularly planted acreage in sweets for Irish potatoes this spring. The Price Quotation Committee has announced a contract price of $4.50 per barrel f.o.b. loading points from June 8 to 20. It is believed that a considerable number of contracts have already been made at that figure in the lower end of Northampton County. —H. H. ZIMMERLEY.

Review of Recent Literature

Roebuck, A.—Eelworm Attack on Potatoes—The Fruit Grower, Fruiterer, Florist and Market Gardner, 65: 51, 52, January 12, 1928. The author states that for a number of years attacks of eelworm (Heterodera schachtii) on potatoes have been reported in different parts of the country, chiefly on allotments and in gardens. Unfortunately it is now invading the big commercial fields in Lincolnshire and as a result is stimulating experimental efforts to control it. An application to the soil of one pound of flake naphthalene to a 9 ft. square plot of land gave good control of this pest. The naphthalene was sprinkled on the surface and then dug into the soil before planting —W. STUART.

Stallings, J. H.—Irish Potato Results at Penney Farms—Florida Farmer 30: 3, March 1, 1928. In conducting experiments on the Irish potato at Penney Farms, among other things studied was that of the effect of different soil types on the yield of the crop. This effect was studied on both spring and fall crops. The yield from the Norfolk type of soil was rated at 100%. The other four types of soil proved to be markedly superior.

Type of Soil	Spring Crop	Fall Crop
Norfolk	100%	100%
Leon fine sand	170	140
Blanton	171	155
St. Johns	224	305
Portsmouth	264	321

—W. STUART.

C. C. H.—Hill Selected Potato Seed Profitable—Successful Farming 26: No. 3, P. 28, March, 1928. William Christ, a large potato grower in the truck section of Jefferson county, Missouri, has for several years past used certified treated seed and has fertilized his land intelligently with the result that much larger yields have been secured. In 1925, at the suggestion of County Agent E. Itschner, he decided to field select his Rural variety of potato. During the growing season Mr. Christ staked a considerable number of the best and thriftiest plants in his field. These plants were hand dug and those having the most uniform sized tubers and the best set and yield were retained for next season's seed plot. In addition, other seed was saved from unselected plants. The following spring these two lots of seed were planted under comparable conditions. The selected seed planted 1½ acres of land but the author fails to state how large an area was planted with the unselected seed. Both lots were given the same treatment. At harvest time 87 per cent from the selected seed graded U. S. No. 1 while only 56 per cent from the unselected seed graded No. 1. The total yield from selected seed was 7000 pounds greater than from the unselected, though the yield from the latter was 65 bushels above the average. No 1 stock sold for 65c a peck while No. 2 brought 40c a peck. The actual cash returns from the hill selected seed was $647.84 as against $355.19 per acre from the unselected seed, or a difference in favor of the former of $291.65 per acre.

—W. S.

Pieper, J. J., and W. F. Flint—Three Temperatures for Seed Potato Storage Studied—Ill. Sta. Rpt., 1926-27, p. 69, 1927. Northern grown and home grown seed potatoes were stored at three different temperatures during the past year to see if home grown potatoes could be made to yield as much as northern grown seed. One year's results show that northern grown potatoes bought just before planting yielded 151 bushels an acre while northern grown seed bought in the fall and stored at 40° F. yielded 134 5 bushels. Home grown potatoes stored under the same conditions yielded 60.6 bushels per acre. Northern grown potatoes also were stored at 31° F. and 33° F. Those stored at 31° F. yielded at the rate of 54.7 bushels and those at 33° F. 131.7 bushels per acre. Home grown potatoes when stored at these temperatures gave only a 10 per cent stand and as a result the yields were not recorded. Home grown potatoes rotted much more than northern grown potatoes under all temperatures of storage.

—W. S.

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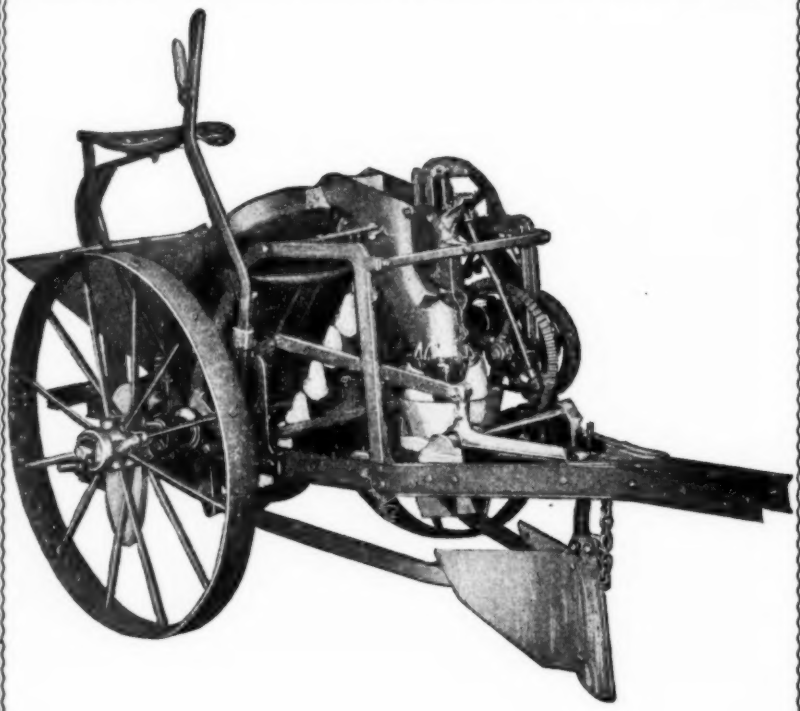

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The Efficiency of Dusting and Spraying Potatoes on Long Island to Control Potato Insects

By H. C. HUCKETT, Entomologist, New York State Experiment Station, Riverhead, N. Y.*

Many potato growers on Long Island are annually faced with the problem of controlling four serious insect pests, namely the Colorado potato beetle, the potato and spinach aphids, the potato leafhopper, and the potato flea beetle. Of these, aphids, leafhoppers and the summer brood of the flea beetle represent a problem in control operations that has not yet been solved in a practical way. The Colorado potato beetle can be kept successfully under control by the average grower; the spring or first brood of flea beetle is not a factor except where rows adjoin woodland.

Weather conditions on the Island are normally conducive to successful potato culture. Cool weather continues until late June; the climate is generally humid during the summer season. Most unfavorable conditions obtain during July when there are periodic occurrences of hot, sweeping, southwest winds. The condition is aggravated by the fact that the plant has to depend for moisture on a soil that lacks humus.

Potato planting proceeds on the average from late March until late April; the plants appear above ground during the latter half of May and are in full blossom during late June and early July; the foliage during August rapidly matures, and by late August is nearly all dead.

Insects occur in injurious numbers during the month of July; aphids become noticeable when the plants are in full blossom; during 1925, 1926 and 1927 this pest was completely destroyed

during the latter part of July by a cold, drenching rain from the southeast; leafhopper injury is first seen during mid-July and rapidly increases during the remainder of the season; the second brood of flea beetle commences to appear during the latter half of July and their numbers rapidly reach destructive proportions during early August. Potato foliage normally is prematurely killed during August through the destructive feeding habits of these latter two pests, the rate of injury being sometimes rapidly increased by the wholesale transfer of the insect population of a field that is "dead" to one in a "green" condition.

Under these conditions, experiments were carried on in dusting and spraying Green Mountain potatoes for insects, especially sucking insects, during July, with the object of determining the efficiency of spraying and dusting operations (1) in killing aphids and checking leafhopper development, (2) in checking the injurious effect of flea beetle and leafhopper feeding on the foliage, (3) by the yield of tubers.

During July plots were treated once a week; in the case of spray, with bordeaux mixture, and in the case of dust, with a copper-lime mixture, to both of which calcium arsenate was added in two applications for the better control of the second brood of flea beetle. For sucking insects, the sprayed plots received two alternate applications of a 3 per cent nicotine-dolomite-hydrated lime dust or two applications of a standard strength nicotine-bordeaux mixture spray. All the applications were thoroughly made under favorable conditions.

The more important results from such operations are summarized in tabular form as follows:

TABLE I

Percentage Increase or Reduction in the Relative Number of Aphids on Potatoes on July 8th and 15th after Treatment on July 6th and 14th.

Treatment	Experiment 1 Applications		Experiment 2 Applications	
	July 6	July 14	July 6	July 14
Sprayed Plots				
Bordeaux Mixture (4.6.50)	—24.8	170.7	—15.7	529.5
Bordeaux Mixture-Nicotine Spray	—15.5	115.3	—22.4	209.9
Nicotine Dust	—46.4	— 83.3	—65.6	1.6
Check				
None	—32.3	583.1	— 7.7	201.6
Dusted Plots				
Copper-lime (20-80)	—12.8	236.2	— 3.5	229.0
Nicotine Dust	—80.4	143.2	— 8.1	— 11.9

TABLE II

Condition of the Foliage following Special Applications during July for Aphids, Leafhoppers, and Flea Beetles, as Indicated by the Extent of Insect Injury to Foliage in Early August.

Treatment	Percentage of Hills Experiment 1 Degree of Injury		Percentage of Hills Experiment 2 Degree of Injury	
	Slight to Moderate	Severe	Slight to Moderate	Severe
Bordeaux Mixture (4.6.50)	45.4	54.6	40.3	59.7
Bordeaux Mixture—Nioctine Spray	57.2	42.8	68.1	31.9
Bordeaux Mixture—Nioctine Dust	84.7	15.3	62.0	38.0
None (Check)	37.7	62.3	.2	99.8
Copper-lime (20-80)	36.0	64.0	28.7	71.3
Copper-lime and Nicotine Dust	65.7	34.3	60.2	39.8

TABLE III

Yield of Saleable Tubers from Plots Dusted and Sprayed during July for the Control of Aphids, Leafhoppers and Flea Beetles.

Treatment	Experiment 1 Bushels	Experiment 2 Bushels
Bordeaux Mixture (4.6.50)	253.6	181.8
Bordeaux Mixture—Nicotine Spray	273.9	214.6
Bordeaux Mixture—Nicotine Dust	316.2	242.7
None (Check)	250.8	155.7
Copper-lime (20-80)	285.9	169.4
Copper-lime and Nicotine Dust	303.5	229.9

The data given in these tables would indicate:

(1) Dusting with nicotine is a more efficient operation for killing aphids than spraying with nicotine. (Table I.)

(2) Dusting with nicotine had the effect of checking to a considerable degree the development of insect injuries on sprayed and dusted plots. Spraying with nicotine averaged slightly less effective, but the results showed a considerable improvement over those plots where no nicotine was used in the spray. Spraying with bordeaux mixture was more effective than dusting with copper-lime mixture. (Table II.)

(3) The highest yields were obtained from sprayed and dusted plots receiving two alternate applications of nicotine dust; there were also marked increases in yield where nicotine had been added to the spray mixture. It will be noted that in Experiment 1 the yield of tubers in the check and dusted plots were much higher than their foliage condition and aphid population would have warranted; otherwise the data tended to show a close correlation between the efficiency of spraying and dusting operations and the yield of tubers. (Table III.)

*Contribution from the Long Island Vegetable Research Farm.

The Improvement of the Potato

By CHARLES F. CLARK, United States Department of Agriculture

There are two general methods by which our farm crops may be developed to a higher degree of perfection. The first of these is through environmental influences, such as increasing the available food supply of the plants by the addition of fertilizers, or applying the various customary treatments for the control of diseases. While these practices are essential for successful crop production, the beneficial results are not permanent but must be repeated with each successive crop.

The other method, which utilizes the influences of heredity, deals with permanent modifications. After these are once produced no further expense or effort is required to maintain their superiority, since they remain constant, barring the possibility of an occasional mutation. Modifications of pathological origin, such as those associated with the virus diseases, do not come within the scope of this discussion. An illustration of this method of improvement may be seen in the control of the potato wart disease by the use of certain varieties which possess natural immunity to this disease. Good crops of such varieties, free from disease, can be produced on soils so badly infected with the wart-producing organism that the commercial production of susceptible varieties would be impossible.

The material for the development of improved varieties of potatoes may be obtained either by the selection of variations which are already in existence or by the production of new types through the process of breeding. The practice of selection involves the consideration of two types of variation, the fluctuating and the fixed, the latter being commonly known as mutations or sports. Variations of the fluctuating type are in most cases considered to be the result of inequalities in the many factors associated with the growth of the plant. It is a well known fact

that the yield of tubers of a given plant is influenced by the size of the seed piece planted, the number of stalks per hill, the amount of moisture and readily available plant food in the soil, as well as other factors. So far as is known, variations due to these causes are not carried over to the succeeding crop when such tubers are used for seed, therefore the development of higher yielding strains cannot be expected to result from the selection of fluctuating variations. It is possible, however, that mutations may arise which result in an increase in the number or size of the tubers. Such variations can be distinguished from those of the fluctuating type only by a comparative test of the vegetative progeny, grown side by side under like conditions, for a period of at least three or four years. Aside from the possibility of securing permanent modifications of value, selection is a very effective means of securing healthy stock and should be practiced by every grower of seed potatoes.

The best known and apparently the most frequently occurring mutations in the potato are those resulting from a change in color, usually in the skin of the tubers, though a few instances have been reported of changes in the color of the flowers. In some varieties the mutant forms are characterized by the loss of color, in others by the addition of color. As a rule only a single genetic factor, or gene, is involved, hence they are known as gene mutations. It has been shown by Asseyeva (1) that the modifications in these mutants are confined to the outer layers of cells only, so that a new variety developed from the tubers of such a form will be a replica of the parent type except in those parts which have been changed by mutation. In the practice of field selection care must be exercised to distinguish between variations which are deviations from the type of the variety planted and mixtures which may accidentally have gotten into the seed stock, or volunteer plants from tubers which may have persisted in the soil from a preceding crop.

Because of the unlimited number of variations, which may be produced at will by the crossing of different varieties, breeding affords the greatest possibility for the permanent improvement of the potato. Of 328 of the commercial varieties developed in this country for which records are available, 93.3 per cent were originated by this method (2).

Potato breeding is most successfully conducted in regions where the summer temperatures are relatively low and the rainfall abundant. Such conditions favor profuse blooming and the liberal setting of fruit. Because of the prevalence of pollen sterility the number of varieties which can be used as the pollen parent for making crosses is greatly restricted. This condition occurs in all varieties which have come to the knowledge of the writer. The degree of sterility varies with the variety, the pollen of some varieties being almost entirely sterile while in others the proportion of sterile grains does not exceed 50 or 60 per cent.

Where facilities for a microscopic examination or a germination test of the pollen are not available, an indication of its viability may be obtained from the observation of the setting of fruit in the field as the result of natural polllination. Varieties which produce an abundance of fruit from their own pollen may be used as the pollen parent in crosses with the expectation of a high degree of success. As seed parents, no varieties are known which will not set fruit when pollinated with good pollen, under favorable conditions of environment. Nearly all, if not all, of the potato varieties now commonly grown are heterozygous in their genetic composition with the result that progenies grown from seed show a very wide range of variation in most characters, with but very few of the seedlings closely resembling the parental forms. This is of great advantage to the potato breeder since it furnishes a large number of types, some of which will be likely to excel the parents in desirable characteristics.

If superior plants are found they can be perpetuated by vegetative propagation of the tubers, no further breeding being necessary. Because of the tendency of seed progenies of the potato to revert to inferior types, only a very small proportion of the seedlings will represent any material improvement, hence it is necessary to grow large numbers in order to obtain a few superior individuals which will be of value for the foundation of new varieties.

The ideal type which should be sought in the development of an improved variety is one which exhibits the most desirable expression of several characters, such as an upright habit of growth of the vines, uniform tubers of good size, with shallow eyes, good cooking quality, high yielding capacity, either round or long, red or white, according to the demands of the market which they are to supply, and resistance to some of the most important potato diseases. To secure desirable combinations of all these characters large numbers of seedlings must be produced. Since only a very small percentage will meet the requirements mentiond above, a large proportion of the hills can be eliminated the first season at the time of harvest.

Because of the labor, expense, and in some instances the difficulties involved in the control of diseases of the potato, the subject of resistance in relation to the development of new varieties is one of special importance. Much of the earlier work in potato breeding was directed toward the control of late blight. It was found, however, that resistance to this disease was associated with poor cooking quality and other undesirable characteristics so that efforts along this line have largely been discontinued. In Europe, atempts to control the potato wart disease by breeding methods, to which reference has previously been made, have been very successful, a large number of high-yielding immune varieties having been produced.

At the present time the efforts of potato breeders in relation

to disease control are largely concerned with resistance to the virus diseases. Studies so far have not shown the presence of the complete immunity to this group of disease that exists in the case of the potato wart disease, but well defined differences in the degree of resistance have been demonstrated for some of the types so that at least partial control may be confidently expected from this source.

Since resistance is specific for each kind of disease and not for all diseases collectively, the fewer the number of diseases whose resistance is desired to be combined in a single variety the greater will be the likelihood of success.

(1) Asseyeva, T. Bud mutations in the potato and their chimerical nature. Journ. Genetics 19:1-26. No. 1. Nov., 1927.

(2) Clark, C. F. The Development of Potato Varieties in the United States. Proc. Potato Assoc. Amer. 1925, pp. 5-8.

Methods of Applying Fertilizer for the Potato Crop

E. M. TAYLOR, Assistant to Superintendent, Experimental Station, Fredericton, N. B., Canada.

Chemical fertilizers are largely used where the potato crop is extensively grown. Their use constitutes a heavy charge against this crop and consequently they should be used in such a manner that the greatest return will be obtained.

Frequent complaints have been heard in recent years from the potato growers about fertilizer injury. In order to obtain information on this problem, experiments were begun at the Dominion Experimental Station, Fredericton, New Brunswick, Canada, in 1923 to determine the best method of applying fertilizer for this crop. A 4.5-8-6 fertilizer mixture was used for the experiments in 1923. In the following years a 4-8-6 mixture was used. Applications have been made (1) broadcast, (2) in the row in direct contact with the seed, and (3) in the row mixed with earth. In 1923 only one rate of application was made, namely, 2000 pounds per acre. In the following years, applications were made at the rate of 1000, 1500 and 2000 pounds per acre. These fertilizers were home mixed. One-half of the nitrogen in these mixtures has been supplied from nitrate of soda and the balance from sulphate of ammonia. Acid phosphate has been used as a source of phosphoric acid and muriate of potash as a source of potash.

The average results indicate that when 1500 and 2000 pounds

of fertilizer are applied for the potato crop, the best results will be obtained when the fertilizer is applied in the row and mixed with earth, although the per cent stand is somewhat less than where the fertilizer is applied broadcast. Applications of 1000 pounds of fertilizer in the row in direct contact with the seed did not appear to result in any reduction of the crop and only slightly reduced the per cent stand. Where 2000 pounds were applied in the row in direct contact with the seed, there was a considerable reduction in the per cent stand, the reduction being greater in some years than others. It has been generally noted that fertilizer injury is probably correlated with seasonal conditions. The actual differences in yield are not as great as observations sometimes seemed to indicate, particularly during the early part of the season. The apparent very great difference in growth in the early part of the season usually disappeared after the middle of July. As there is no way of forecasting seasonal conditions, the results would indicate the advisability, when applying a large amount of fertilizer in the row, of having the potato planter adjusted to keep the sets away from direct contact with the fertilizer.

In 1925 and 1926 experiments were carried on to determine the constituents in the fertilizer that cause injury, if any. In 1925, nitrate of soda, sulphate of ammonia, acid phosphate and muriate of potash were applied separately in the row in direct contact with the seed in such quantities as would be supplied in a ton of 4-8-6 mixture.

In 1926 this experiment was modified. Nitrate of soda, sulphate of ammonia, acid phosphate and muriate of potash were applied separately in the row in direct contact with the seed in such quantities as would be supplied in a ton of a 4-8-10 mixture. The other constituents such as would be found in a ton of a 4-8-10 mixture were applied broadcast. The results are shown in Table "B":

TABLE "B"

Source of Fertilizer Injury

Chemical Used	Per Cent Stand 1925	Per Cent Stand 1926	Average of 1925 and 1926
Nitrate of soda	59.0	94.4	76.7
Sulphate of ammonia	66.7	92.9	79.8
Acid phosphate	68.7	99.4	84.0
Muriate of potash	72.2	97.4	84.8

The results of two years observations seem to indicate that it is the nitrate of soda and sulphate of ammonia which are apparently largely responsible for the reduction in the per cent stand. These latter experiments have not been carried on for sufficient time to justify definite conclusions, but the splendid results sometimes obtained from the application of part of the nitrogenous fertilizer just as the crop is coming through the ground may be due in part to the fact that heavy applications of nitrogenous salts have not been made in the rows in direct contact with the seed. Further work is being planned from which it is hoped that more definite conclusions may be drawn.

Seed Potato Treatments in 1927

C. R. ORTON and G. F. MILES, The Bayer Company, Inc., New York.

During the past four years a growing interest has been shown in America with regard to the use of organic mercury compounds for seed and soil disinfection, as well as in the therapeutic treatment of growing plants. Among the numerous applications of these compounds as disinfecting agents, that of seed potato treatment by the dip method has received considerable attention during the past two years for the following reasons:

1. There is a great saving of time and labor.
2. The treatments can be used on the cut seed, which seems to be of importance under special conditions.
3. There is a greater margin of safety from the standpoint of seed injury.
4. There is a substantial increase of the yield.
5. The commercial control of scab and rhizoctonia has been demonstrated.
6. The cost is only slightly more than with the old standard materials, formaldehyde and corrosive sublimate.

The experiments in 1927 have been conducted much more intensively, as well as extensively, than previously and the results brought together in this paper summarize all of the data available from the past season's experiments. It is necessary to mention, however, that a few of the official cooperators have requested that their data be omitted from this presentation, and their wish has been honored. While these omissions lessen, to some extent, the distribution of the data, they do not change the results materially. To the cooperators who have granted us permission to present portions of their results with Dipdust in summarized form, we are particulaly grateful.

YIELD DATA

The experiments on which these data are compiled were conducted in the chief potato producing states from Maine to Oregon, as well as in the eastern coastal region from New York to Florida, inclusive. In addition to what may be called the "official" experimental results (Table I), a series of county agent demonstrations was conducted over a similar territory, and these results are presented separately (Table II).

TABLE I

Seed Potato Treatment Experiments, 1927

		Yield Data		Percent Incr. or Decr.			Cf. with check
State*	Var.	Rep/No. Hlls	Check	Formal-dehyde	Corro-sive sub.	Dip-dust	Time of Trtmt.
1 Colo.	Cobbl.	8/26	365.1	.....	.....	+ 1.1	A. C
2 Conn.	Cobbl.	2/75	322.6	— 5.0	+20.8	— 8.1	A. C.
3 Conn.	Cobbl.	2/75	293.9	— 6.5	+ 6.3	— 1.3	A. C.
4 Fla.	Cobbl.	6/50	196.3	.....	.....	+18.0	A. C.
5 Maine	Cobbl.	9/26	339.7	.....	.....	+19.8	A. C.
6 N. J.	Cobbl.	5/40	273.7	.....	.....	— 0.9	A. C.
7 Minn.	Ea. O.	4/24	204.6	— 7.2	+ 9.8	+13.7	A. C.
8 N. D.	Ea. O.	5/26	72.8	+ 8.0	+ 2.3	+ 8.7	A. C.
9 N. D.	Ea. O.	3/36	151.0	+ 9.9	—19.2	+12.5	A. C.
10 N. J.	Gr. Mt.	5/40	316.6	.....	.....	+ 1.1	A. C.
11 N. Y.	Gr. Mt.	4/?	132.0	.....	.....	+28.7	A. C.
12 Ore.	Gr. Mt.	8/20	172.8	— 1.4	— 6.2	+21.2	A. C.
13 Mich.	Russ.	?	144.6	.....	— 3.9	+ 4.5	A. C.
14 Colo.	Trium.	8/26	334.0	.....	.....	+ 6.1	A. C.
15 Kan.	?	7/40	219.2	— 6.0	.....	—18.0	A. C.
16 Kan.	?	3/20	176.5	+23.3	.....	+ 4.5	A. C.
17 Kan.	?	6/40	247.8	+13.1	.....	— 4.6	A. C.
18 Conn.	Cobbl.	2/75	301.8	+13.7	+ 7.8	+ 5.4	B. C.
19 Conn.	Cobbl.	2/75	264.7	+24.0	+12.0	+16.7	B. C.
20 Maine	Cobbl.	9/26	339.7	+18.9	+23.1	+18.5	B. C.
21 N. J.	Cobbl.	5/40	273.7	.....	— 0.3	— 5.4	B. C.
22 N. Y.	Cobbl.	10/50	206.5	.....	— 0.7	+ 9.5	B. C.
23 Minn.	Ea. O.	5/22	243.7	—30.4	—40.0	+ 5.4	B. C.
24 Minn.	Ea. O.	4/24	215.0	+22.0	+41.0	+ 8.2	B. C.
25 N. J.	Gr. Mt.	5/40	316.6	.....	+ 3.6	+ 4.2	B. C.
26 N. Y.	Gr. Mt.	4/?	229.0	.....	— 6.1	0.0	B. C.
27 N. Y.	Gr. Mt.	4/?	203.0	.....	—15.7	— 7.8	B. C.
28 N. Y.	Gr. Mt.	10/50	201.6	.....	— 1.1	+ 3.9	B. C.
29 N. Y.	Gr. Mt.	4/?	165.0	.....	+5.4	+ 5.4	B. C.
Mean Inc.				5.5	2.0	9.7	
Odds				8.32:1	2.25:1	490:1	

TABLE II

Seed Potato Treatment Demonstrations, 1927
Yield Data

State	Grower	Address	Untreated Yield Bu. per Acre	Treated Inc. or Dec. (—) Bushels	% Inc. or % Dec. (—)
ALA.	E. D. Vineyard	Guntersville	57.0	2.0	3.5
MICH.	Rossman Bros.	Lakeview	141.1	10.0	6.4
MINN.	H. O. Dickey	Elk River	140.0	25.0	17.8
	F. Behling	Moorhead	120.0	30.0	25.0*
N. J.	W. Hand	Cranbury	264.4	24.3	9.3
	R. G. Dorrer	Freehold	284.3	2.0	0.3
	F. Brunner	Cranbury	241.0	14.0	5.6
	F. Brunner	Cranbury	250.0	25.0	10.0
N. Y.	Norris Bros.	Monroe Co.	138.0	34.5	25.0
	A. J. Keafer	Monroe Co.	180.0	20.0	11.1*
	R. B. Martin	Monroe Co.	100.0	17.3	17.3*
	Geo. Schoen	Monroe Co.	270.0	—22.5	— 8.3*
	Dean Keyes	Monroe Co.	170.0	29.6	17.4
	C. Chupp	Ext. Spec.	206.2	2.2	1.0
N. C.	State Hosp.	Mt. Olive	61.2	10.7	17.4
	State Hosp.	Mt. Olive	67.2	4.7	7.0
	H. F. Sample	Eliz. City	300.7	—11.5	— 3.8
	M. Sample	Eliz. City	271.0	11.4	4.2
S. C.	W. E. McLeod	James Island	167.4	9.0	5.3
	T. P. White	Johns Island	143.3	22.6	15.7
	E. L. Rivers	Martins Point	177.0	9.0	5.3
	J. C. Seabrook	Martins Point	175.6	26.3	14.9
	C. F. Davis	Martins Point	112.9	9.3	8.2
	Newcut Plant	Martins Point	163.1	8.7	5.3
	Newcut Plant	Martins Point	201.6	17.4	8.6
	F. P. Fleming	Mt. Pleasant	161.0	47.1	29.2
WIS.	R. E. Vaughan	Ext. Spec.	165.0	31.5	19.0**
	R. E. Vaughan	Ext. Spec.	192.0	4.5	2.3
Average increase 28 tests				14.8	10.0

*In these tests the check was treated with corrosive sublimate.
**In this test the check was treated with hot formaldehyde.

Of paticular significance, we believe, are the comparative increases in yield between the Dipdust treated plots in the experi-

ments and demonstrations. The numbers and the odds in each table are sufficient to indicate that an average increase of about 10 per cent is to be expected from Dipdust seed treatment. Formaldehyde (hot) treatment gave a 5.5% increase in the experimental data, but it was not used in a sufficient number of cases in the demonstrations (Table II) to warrant inclusion. Corrosive sublimate failed to show equal rank as far as yields are concerned.

It should be noted that these data are averages for several different tests and it should not be concluded that hot formaldehyde is superior to $HgCl_2$ under eastern conditions, nor vice versa under certain western conditions. The yield results with Dipdust throughout the country were more uniform than with either hot formaldehyde or corrosive sublimate.

RHIZOCTONIA CONTROL

The data are taken from 24 experiments conducted in eight different states and include comparisons of Dipdust, hot formaldehyde and corrosive sublimate respectively with the untreated checks. The majority of the data was based on the percent of rhizoctonia detected on tubers at harvest, but it also includes a number of cases of data on stem lesions. The following table gives the results, showing that corrosive sublimate is the most effective treatment for the control of rhizoctonia, followed by Dipdust and hot formaldehyde. The odds computed from Student's Table are high in each case.

There is a larger chance for error in the data on sclerotia on tubers at harvest, and in future work it is urged that data on stem lesions and rhizoctonia hills be taken, since these present a much more accurate picture of the efficiency of seed treatment than do sclerotia on tubers, for the reason that soil borne rhizoctonia frequently develops late in the season on tubers grown from seed pieces which were completely disinfected regardless of the method or material used.

*The cooperators were as follows:

Colorado	H. G. MacMillan
Connecticut	B. A. Brown
Florida	L. O. Gratz
Idaho	J. M. Raeder and C. W. Hungerford
Kansas	O. H. Elmer
Maine	E. S. Schultz, L. O. Gratz, and R. Bonde
Michigan	H. C. Moore
Minnesota	J. G. Leach and H. W. Johnson
New Jersey	W. H. Martin
New York	C. Chupp and E. E. Clayton
North Dakota	W. E. Brentzel and A. F. Yeager
Ohio	H. C. Young
Oregon	M. B. McKay and T. P. Dykstra

TABLE 111

Rhizoctonia Data

Experimental Results, 1927

State	Check % Disease	Formaldehyde % Inc. + or De. — cf.wi.chk.	Corrosive Sublim. % Inc. + or De. — cf.wi.chk		Dipdust % Inc. + or De. — cf.wi.chk.	Character of Data	Time of Treatment
Maine	9.2	+ 21.3	—100.0		—95.5	Stem les.	A. C.
Maine	27.0	— 7.4	— 48.0		+51.7	Sclerotia	A. C.
Mich.	54.0		— 99.1		—86.2	Sclerotia	A. C.
Minn.	35.8	—100.0	— 85.1		—23.7	Stem les.	B. C.
Minn.	69.1	— 27.6	— 51.7		—18.3	Stem les.	B. C.
Kans.	57.0	— 56.1			—17.7	Stem les.	A. C.
Kans.	56.0	—71.4			—71.4	Stem les.	A. C.
Kans.	51.0	— 72.5			—60.0	Stem les.	A. C.
N. Y.	30.0		— 63.0		—34.7	Sclerotia	A. C.
N. Y.	19.4				—38.0	Sclerotia	A. C.
Conn.	36.1	— 77.3	—100.0		—40.7	Sclerotia	B. C.
Conn.	36.1			lim	—60.1	Sclerotia	A. C.
Conn.	36.9	— 26.8	—100.0		—65.5	Sclerotia	B. C.
Conn.	36.9			unli	—22.8	Sclerotia	A. C.
Conn.	52.7	+ 9.5	— 58.3		—43.0	Sclerotia	B. C.
Conn.	52.7			lim	—30.9	Sclerotia	A. C.
Conn.	50.4	— 12.8	— 87.5		—35.3	Sclerotia	B. C.
Conn.	50.4			unli	—00.2	Sclerotia	A. C.
Ore.	46.5	— 30.0	— 9.4		— 7.8	Stem les.	A. C.
Ore.	92.8	— 20.8	— 8.9		— 5.5	Scler. on tub.	A. C.
Ida.	79.2	— 44.7	— 74.6		—11.1		B. C.
Ida.	79.2				— 7.8		A. C.
Ida.	79.2				—11.0		B. C.
Ida.	79.2				—20.6		A. C.
Mean	47.0	— 39.6	— 68.1		—31.5		
Odds		2499:1	9999:1		9999:1		

CONTROL OF SCAB

While the data on scab control with Dipdust are not as extensive as those on rhizoctonia, nevertheless they are clean-cut and consistent. It is unfortunate that formaldehyde and corrosive sublimate were not included a sufficient number of times to warrant the use of statistical methods of computing their reliability.

TABLE IV

Scab Data

Experimental Results, 1927

State	Variety	Check	Formaldehyde	Corrosive Sublim.	Dipdust	Time of Treatment and Dilution
No. Dak.	Early Ohio	31.8	—46.5	+31.4	+44.3	?
No. Dak.	Early Ohio	50.0	—64.0	—14.0	+12.0	?
N. J.	Cobbler	72.1	.....	—59.0	—58.3	B. C. (1-10)
N. J.	Cobbler	72.1	.....	.....	—59.5	A. C. (1-10)
N. J.	Cobbler	72.1	.....	.....	—42.4	B. C. (1-20)
N. J.	Cobbler	72.1	.....	.....	—59.7	A. C. (1.20)
N. J.	G. M.	32.0	.....	—89.4	—50.0	B. C. (1-24)
N. J.	G. M.	32.0	.....	.....	—79.7	A. C. (1-24)
N. Y.	G. M.	78.8	—15.4	.....	—12.6	B. C. (1-20)
Ohio	?	77.1	.....	—90.5	—82.0	B. C. (1-20)
Ohio	?	77.1	.....	.....	—92.6	A. C. (1-20)
Ohio	?	77.1	.....	.....	—79.0	B. C. (1-24)
Ohio	?	77.1	.....	.....	—80.2	A. C. (1-24)
Mean	Odds 1523:1	57.0	—42.0	—50.6	—49.2	

B. C.—Before cutting.

A. C.—After cutting.

SUMMARY

From the standpoint of the control of rhizoctonia of potatoes by seed treatment, the instantaneous method with "Dipdust," the organic mercury compound manufactured by the Bayer Company, Inc., does not show as high fungicidal value as the treatment for one and one-half hours in corrosive sublimate. In the case of scab, "Dipdust" appears to be generally as effective as either formaldehyde or corrosive sublimate. "Dipdust" reduces both diseases markedly and in view of the great saving in time and labor as well as the increase in yield, this compound offers particular promise to the practical potato grower who has never been satisfied with the older and more laborious methods.

Crop and Market News

Southern Potato Shipments Active

(Contribution from Bureau of Agricultural Economics)

Like the tide of a geat battle, sometimes the tide of the potato market changes "over-night." There was still such a chance during early May, but the probability did not seem very strong. Prices had been declining over a long period, and the situation was weak at the opening of the month. Many operators were still hoping for a rise in prices of old potatoes, but new stock is coming from the south in increasing volume and soon will crowd northern-grown potatoes off the market.

When compared with prices of the last two years, there was some ground for discouragement. However, in comparison with values during the seasons of 1920 to 1924, recent potato prices have been relatively high. The Chicago carlot market during March averaged around $2.35 per 100 pounds, compared with $2.42 in March, 1927, and $4.04 in 1926. But from 1921 to 1925 the March averages in Chicago were between $1.25 and $1.80.

PRICES TENDING DOWNWARD

Since the beginning of April, very general declines of 30c-75c per 100 pounds have been reported on old potatoes. The most striking feature of the situation was the weakness of the shipping-point market in northern Maine. The decline there was greater than anywhere else, in spite of rumors of relatively light holdings. By May 4, shippers in Aroostook County were getting only $1.35 bulk per 100 pounds, as against sacked western New York potatoes at $1.95. North Central shipping points held better than other districts during the month and closed at a range of $1.50-$1.85. Colorado reported most sales within a range of 80c-$1.35, depending chiefly on variety, while the southern Idaho f.o.b. market for Russet Burbanks had dropped to 80c. Chicago carlot sales averaged about $1.75 on northern and western stock. This period of depression in the old-potato market was in sharp contrast to values of a year ago, when prices were at their spring peak. Early May prices this season were one-third to one-half lower than those of May, 1927.

Though shipments continued fairly active, especially from Maine and Idaho, the volume was much lighter than during February and March. Daily track holdings in large markets were reduced to about half what they were a month or six weeks before—and still the market seemed unable to get on its feet. By early May, shipments of old stock were averaging around 600

cars daily and new stock 125 cars a day. Because of the earliness of the 1927 season and the delay this year, the 1928 movement of southern potatoes has been less than half that of a year ago. Forwardings were expected to increase rapidly during May, with heavy output in June. The quick drop in prices of new stock was almost sensational. Lower Rio Grande Valley shipping points had declined to $2.50 sacked per 100 pounds, and best Florida potatoes were bringing only $4 and $4.50 per barrel in the Hastings district, or $1 less than during early May, 1927.

WEATHER AFFECTING THE CROP

Cold weather delayed the early crop in various southern states and there may be considerable overlapping during the latter part of this month and in June. Akansas Valley potatoes were damaged as much as 50% in some fields by the April freeze. Frosts also caused slight injury in North Carolina and the Norfolk section. However, the North Carolina crop in general shows exceptionally good stands, and condition was estimated at 88% of normal. A good stand is reported at Norfolk, Va., though frosts cut back the crop to some extent. Heavy rainfall was experienced in various southeastern sections and in the Gulf States. Movement of Alabama potatoes was scheduled to begin about May 8 and South Carolina about the 10th, with peak shipments from South Carolina about May 25. Widely divergent reports come from South Carolina. Some growers claim that their crops will not turn out as well as last year, but others expect a heavy increase. One unofficial estimate is for as high as 7,000 cars in South Carolina. No one can tell yet what the final harvest will be. Total commercial production of potatoes in Florida is forecast as 2,944,000 bushels, or just about the same as last year, but the crop in the lower valley of Texas is one-third lighter than the 1927 crop and amounts to only 657,000 bushels. The southern Texas season will soon be finished, after which shipments will start from the Ealge Lake-Wharton district. Louisiana was already active.

Commercial plantings of early potatoes in nine southern states, outside of Florida and the lower Rio Grande Valley, appeared to be increased this season to a total of 227,000 acres, or 30,000 more than last year. The gain is shared by nearly all the states except Louisiana. South Carolina plantings are increased fully 50% and may reach the high total of 28,000 acres. With 40,000 acres, North Carolina also has the heaviest plantings in that state during recent seasons. Virginia's total is increased sharply to 85,000 acres. This general increase of acreage probably means heavier market supplies this spring. But, whether the crop will be in proportion to the plantings is questionable, because of the uncertainty of weather conditions and other factors affecting production. It may be said that all evidences now indicate that there will be no scarcity of southern potatoes.

Notes

MICHIGAN

There will be a new district potato show held in Michigan next fall. This will be the Southern Michigan Potato Show, which will probably be staged at Kalamazoo. Plans for the new show were made by growers, county agents and others at Kalamazoo, April 30.

Other district potato shows in Michigan that have been organized during the past five years are: Top o' Michigan Potato Show, Gaylord; Thumb o' Michigan Potato Show, Mayville; Western Michigan Potato Show, Big Rapids; Greenville Potato Show, Greenville; Missaukee-Wexford Potato Show, Cadillac, and Traverse City Potato Show, Traverse City.

—H. C. MOORE.

CANADA

Notes on the Use of Fertilizers on Potatoes in Ontario

The use of commercial fertilizers in potato-growing in Ontario has received a marked impetus during the past five years. Pre-

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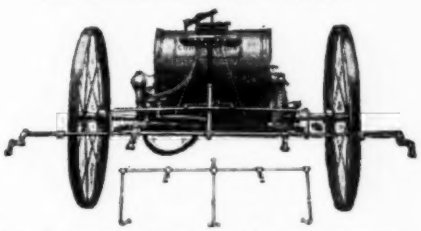

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viously, only a few of the outstanding growers realized their value in increasing the crop yield.

Since 1921, the Soils Branch of the Department of Chemistry of the Ontario Agricultural College has been conducting a great deal of experimental work with fertilizers on potatoes, at different points in the province, the object being to determine the fertilizer requirements of the potato according to climatic conditions, soil type, previous cropping and soil preparation. The outstanding results have, in turn, been furthermore brought to the growers' attention by numerous cooperative plots which are widely scattered throughout all of the important potato growing sections in the province.

As a result of this work, the potato growers of Ontario are using mixtures that are very closely adapted to their conditions. Consequently, providing that other factors are eliminated, every grower who uses commercial fertilizer in addition to farmyard manure, obtains very pofitable returns from the money invested therein.

From the investigational work conducted, it was found that the phosphorous content of the fertilizer mixture on all soil types should not be less than 10% and preferably 12%.

The percentage of potash required will vary according to the soil type. On heavy sandy loams, from 4% to 6% seems to be sufficient, while on light sandy soils deficient in organic matter, 8% of potash gives profitable returns.

The nitrogen content of the mixture will be determined according to the fertility and previous preparation of the soil and whether early or late varieties are grown.

—N. J. THOMAS, Guelph.

COLORADO

Better Brown Beauty Potato Contests

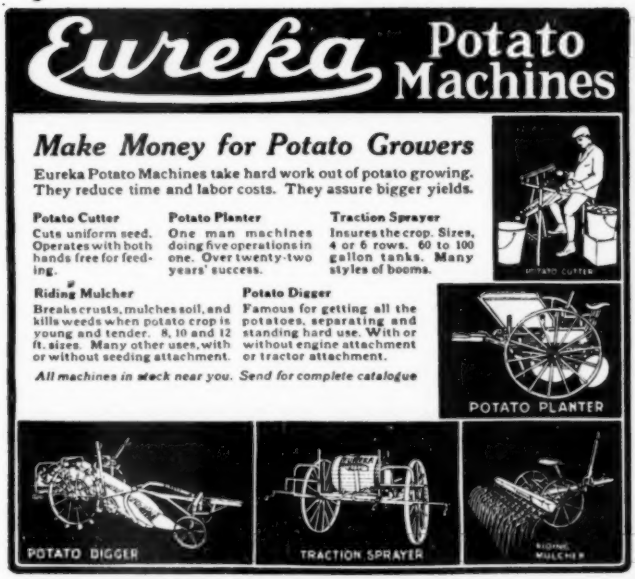
The Brown Beauty potato is grown exclusively in the San Louis Valley of Colorado, which is almost as large as the state of Massachusetts. There were 11,000 cars shipped from the valley this past season, about 6,000 of which were Brown Beauties. The valley is at an altitude of 7,600 feet, the soil is a gravel loam, sub-irrigation is the general practice and conditions are ideal for quality potato production. Because of these ideal conditions, many practices, i. e., sub-irrigation and the planting of small whole tubers which go through the screen in sorting commercial stock and known in other sections as culls, practices which result in failure in other sections, have been quite successful for quite a number of years. This variety has an excellent market in the southern states but attention has been drawn to the fact that it has deteriorated in quality. A certified seed program has been carried on but growers have failed to use this superior grade of seed because of the practice of planting small whole

tubers. In order to emphasize the value of better seed and to improve the general seed stocks, two lines of work will be carried on in 1928, i. e., a 600 bushel club and a Brown Beauty seed plot contest.

Last year a Potato King contest was sponsored by County Agent Stewart of Rio Grand County to determine the limit of the yield club to be formed. The contest was won by Mr. Speicer with a yield of 833 bushels from a measured acre in his commercial field of Peachblow potatoes. Of the fifteen entries, eleven had yields over 600 bushels, so it was decided that a 600 bushel club would be formed for the valley. This year a new feature will be included; the potatoes will be graded by a State-Federal inspector and the award made to the largest yield of U. S. No. 1 potatoes. This contest is stimulating an interest in better seed and better rotation and cultural practices.

The Brown Beauy seed plot contest is being sponsored by the Denver & Rio Grande Western and the San Louis Central railroads, each in its respective trade territoy, and will run for two years, 1928 and 1929. In 1928 it will be limited to boys and girls between the ages of 12 and 18 years, but in 1929 it will be open to everyone. Cash awards amounting to $375 are offered in 1928 and will be doubled for 1929. A great deal of interest is being shown in this contest and some excellent results are anticipated.

—C. W. METZGER.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Scab Control

Dr. William H. Martin, New Jersey Experiment Station, speaking of his work in potato scab control, says:

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IDAHO

It is a bit early to know what the tendency will be this year on the seed potato situation here. From what correspondence I have, and from inquiries, I really suspect that we shall have approximately the same amount as last year. This was 725 applications for an area of about 8,000 acres.

I look for some increase in proportion of Bliss Triumph this year over what we have had before. Previously about 90% of all potatoes planted were Netted Gems, but with the present demand for Bliss Triumph seed in the southern states we have more tendency toward that variety.

—E. R. BENNETT.

—

Potato growers in Idaho have signified their intention to plant more potatoes in 1928 than in 1927. A record acre yield of 212 bushels per acre resulted in a total of 24,380,000 bushels being produced in Idaho last year. With a plentiful supply of irrigation water assured and an increased acreage planned, the crop this year may be even larger than last

Idaho produced about 800,000 bushels of certified seed last year, ranking second, Maine with over 1,000,000 bushels being first. Certified seed has been moving briskly during the last two months at from $1.75 to $2.50.

Certification this year will again be carried on under the direction of E. R. Bennett, Field Horticulturist of the University of Idaho Extension Division. Mr. Bennett will have three assistants who will do the major part of the actual field inspection. Every field will be inspected three times during the growing season.

—C. W. HUNGERFORD.

LOUISIANA

The Louisiana potato tour which was held in southern Louisiana April 17-20 was well attended, many visitors from outside the state being present The tour included La Fourche, Terrebonne and Iberia Parishes. In some respects the sixth annual potato tour was superior to former tours in that a greater interest is being taken by many of the growers in the production of larger yields. The condition of the potato crop in southern Louisiana this season is much better than last season. A few potatoes were being shipped from Terrebonne Parish on the 19th but digging will not become general before May 5 or thereabouts. Some excellent fields were noted in all three parishes but it seemed to the writer that the Terrebonne Parish growers had a shade better fields than those in the other two parishes. It was of interest to note that the use of commercial fertilizers is on the increase, but as a rule they are not as yet used with a sufficient

degree of liberality to produce maximum potato crops. The benefits to be derived from turning under leguminous cover crops such as soy beans, cow peas, or other crops of a similar nature are beginning to be more generally recognized. Interest in good seed is becoming greater and it is believed that the time is not far distant when it will be difficult to find a grower using uncertified seed or at least seed of which he does not know its history. With a larger acreage this year than in 1927 and a much better crop yield prospect, the grower's interest is naturally centering around the question as to the probable price which he will receive.

In regard to disease prevalence, it would seem as if the percentage of mosaic disease in several fields inspected was higher than is justified in certified stock. An interesting feature regarding the mosaic infection noted was that probably 90 per cent of it was of the rugose type. Some lots showed as high as 30 per cent, while a few ran as low as 3 per cent or less.

—WM. STUART.

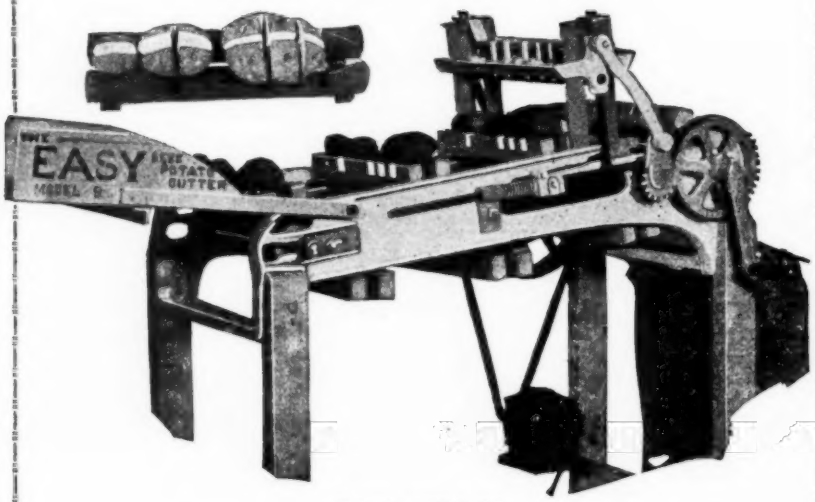
NEW JERSEY

Planting the potato crop has been delayed this year due to the very wet weather of the past several weeks. The acreage for the State has increased slightly as compared with last year, the last estimate for 1928 being approximately 58,000 acres. Most of the seed came from Prince Edward Island, Maine, and New York, with smaller amounts from Vermont, South Jersey, Virginia and Maryland. For most part, the seed was certified. There was a marked increase in the amount of seed disinfected before planting. Three years ago it is doubtful if more than 5 per cent of the seed planted in New Jersey was disinfected for the control of scab and rhizoctonia. This year, in many of the potato growing sections, 95 per cent of the seed was disinfected and the average for Central Jersey will probably reach 65 to 70 per cent. In nearly every case the growers used one of the organic mercury dip treatments.

It will be recalled that a seed potato certification conference has been held at Freehold the past three years. Last year, representatives were present from all the eastern states and Canda and the meeting was a decided success. This year again samples of the various degenerative diseases have been planted at Freehold in anticipation of a similar meeting. While definite plans have not yet been made, it is probable that the meeting will be held some time in June. All interested in seed potato certification are invited to attend. The date will probably be just in advance of the Long Island tour, so that visitors from a distance can attend both meetings. Further announcements will be sent out in the near future.

—WM. H. MARTIN.

The New Simplified E-Z-Way Seed Potato Cutter



Patent applied for

This cut shows our New E-Z-Way potato cutter, also a sample of the 2-4 and 6 piece cut. It will also make an 8 piece cut. Notice the exact uniformness and exactness of the cuts. No hand cutting can do such uniform cutting. It is not necessary to grade the potatoes according to size, the carrier cups carry the potatoes forward to the cutting head, and the potatoes are cut into the desired number of cuts.

The simplicity of the cutter is apparent to anyone at a glance, and a 14 year old boy can operate it, and two boys can keep more than 2 planters going. Can be operated by crank or ¾ H. P. Motor.

To insure good healthy stands it is necessary that the seed is fresh cut, full of sap and vitality, and also uniformly cut, so that the planter can do accurate work. This alone insures perfect stands of vigorous plants.

Every year in some section, just as planting begins, it commences to rain, planting is delayed, and in the meantime the seed that has been cut ahead by hand, is drying out, fermenting and losing its vitality, resulting in devitalized stands of spindling plants that never grow strong.

Chas. H. Jewell of Rhinelander, Wis., states that he has grown potatoes for the last eighteen years, and the last eight years nothing but seed for the Long Island, N. Y. market. And that since using our cutters he has had better stands than ever before, owing to the fresh uniform cut seed. Also one cutter will keep two planters going and a 70 acre field will pay for the machine.

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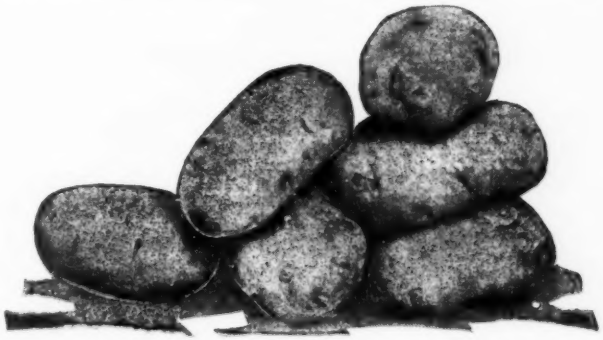

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OHIO

The early potatoes in the Ohio River District are planted. This planting was done during a warm period in March. Since that time the weather has been cold. At present we are having rains with continued cold weather. If this continued cold weather will effect the stand, cannot be predicted at this time. There was a large acreage in the southern section. Intentions to plant indicate that there will be a 20% increase in the acreage here in Ohio.

A State Potato Show will be held during Farmers' Week, February 4-8, 1929. This show is sponsored by the Extension Department in cooperation with the potato interests.

—E. B. TUSSING.

VIRGINIA

The writer spent the latter part of last week in the potato section of the Eastern Shore of Virginia. Potato plants are visible above ground throughout the whole of the Eastern Shore of Virginia section and are probably advanced about as far as is usual for this time of the year. A heavy frost on the 17th and 18th of April froze back the early plants which were above ground at that time but the injury was of small consequence as it affected only Accomac County and the upper part of Northampton County where the potatoes were not as far advanced as in the lower section, where the frost was not injurious.

In the vicinity of Norfolk the potatoes are now about six inches to 10 inches in height. The stand throughout the potato section is exceptionally good and only a very small per cent of rot has occurred. An unusual situation, absence of Colorado potato bugs, exists this year. The writer thus far has not seen a single specimen of this pest. Undoubtedly they will appear later but it will mean less spraying on the part of the farmers to keep them under control and practically no damage from hard shell beetles which are often injurious just as the potatoes are appearing through the ground.

—H. H. ZIMMERLEY.

NEBRASKA

On the basis of information available at the present time it appears that a somewhat larger acreage than normal has been planted in the early potato regions of Nebraska. Due to the very high price just before the planting season this year it appears

that a smaller acreage than usual was planted with certified seed potatoes. The crop was planted very early but due to extremely dry weather has made very little headway during April. Each year an increasingly greater acreage of early potatoes is planted with the Irish Cobbler variety.

In view of the fact that Nebraska certified Triumph seed potatoes produced in the western part of the state sold for an average of almost $3 per cwt.—approximately three times the price of No. 1 uncertified stock—there is considerably more than usual interest in certified seed potato production. According to present prospects, the acreage entered for certification will be probably double the amount entered last year. This acreage represents increased acreage planted by old growers and a considerable number of new growers or growers that have been out of the certification business for a number of years. Up to the present time more cars of certified seed (1928 crop) have been contracted for than has been the case in any previous year. The contract prices are fair from the standpoint of both the southern buyer and the seed potato poducer, especially when considering the crop tendencies for the current year.

As a result of the extensive experiments on scab control conducted by the Experiment Station during the last two years, hot formaldehyde is being recommended in preference to all other methods. The potato growers in western Nebraska, especially the certified seed growers, are adopting this method on a wholesale scale this year. A large number of growers have purchased seed treating outfits. The general adoption of this method of treating seed potatoes should result in a very small amount of scabby potatoes next fall. The type of results secured with this method were reported from this station in a previous number of the Journal. —H. O. WERNER.

Review of Recent Literature

Stuart, Wm., W. C. Edmundson, P. M. Lombard and G. W. Dewey. Source, Character and Treatment of Potato Sets.—U. S. Dept. of Agriculture, Technical Bul. No. 5, Dec. 1927.

Apical and Basal Sets. Experiments with apical and basal sets, with seed pieces of different sizes, were conducted at Norfolk, Va., and Presque Isle, Maine. The data taken as a whole indicate that as the weight of the set increases there is a greater response from the apical than from the basal set.

Oversized vs. normal sized seed tubers. Sets from oversized (12 oz. to 16 oz.) tubers were found to be as productive as those from normal sized (4 to 7 oz.) tubers. Oversized pieces result-

ed in more waste in cutting and required more seed by weight to plant an acre.

Immature vs. Mature Seed. In connection with the question of mature or immature seed potatoes, a review of the representative literature indicates that most workers reporting on this problem obtained increased yields, sometimes quite strikingly so, from the use of immature seed. However, most of them failed to consider or did not report upon the disease factor and consequently their results cannot be considered indicative of what can be expected except under their peculiar conditions.

During a five year period, immature Irish Cobbler seed, procured in Maine by harvesting on different dates or by planting on different dates, when planted at Norfolk, Virginia, the following year produced slightly less prime tubers and a slightly lower total yield than the mature stock.

At Presque Isle, Maine, immature Irish Cobbler seed was found to be more productive than mature seed, each year during a six year test. When immature seed was secured by late planting (first 3 years) it was reported to have contained more disease than the mature stock, whereas when immaturity was due to early harvesting (last 3 years) the lots from the mature seed showed the most disease. No statement is given as to what diseases were considered or how or when disease readings were made.

At Greeley, Colorado, Rural New Yorker potatoes (procured by early harvesting) produced in irrigated fields, produced slightly higher yields than mature tubers during three out of five seasons. However, the average difference for the five year period was hardly significant, having been only about 1% of the mean total yield.

At Jerome, Idaho, immature seed of each of the Charles Downing, Russet Burbank and Peoples varieties, showed a very distinct increase in yield in comparison with mature stock. Disease readings in connection with the reports from this station might throw some light on these striking differences, but no such readings are reported.

Greened and ungreened sets. An extensive review of the literature dealing with the question of "greening" seed potatoes is presented. This practice is reported to have been found very desirable under European conditions (especially in England).

The experiments conducted at Norfolk, Va., Presque Isle, Maine, Greeley, Colo., and Jerome, Idaho, did not show greening to be a desirable practice from the standpoint of increasing yields.

—H. O. WERNER.

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A POTATO plant should have available for its use ample quantities of a well-balanced fertilizer. Unless it has nitrogen, phosphoric acid, and potash in correct proportions, hunger signs are apt to appear.

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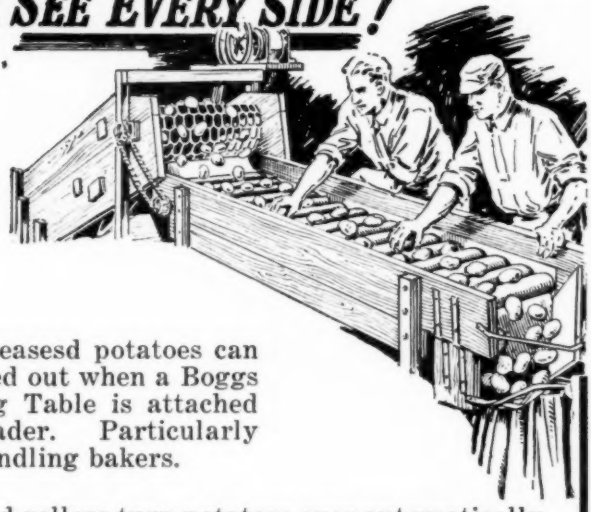

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Important Cultural Practices for Optimum Potato Production

DONALD J. MACLEOD, Plant Pathologist, Fredericton, New Brunswick

By virtue of the fact that the potato tuber develops entirely underground, its quality, shape, freedom from disease and yield are naturally influenced by such factors as the humus and moisture content, texture and temperature of the soil in which it grows. Carefully conducted experiments have proven that all these factors can be modified sufficiently to render soils of average fertility eminently adaptable for potato production. Therefore in order to attain greatest success with potatoes, whether intended for table or seed purposes, it is not only desirable but imperative that proper cultural practices involving strict cognizance of the best methods for improving such influencing soil conditions should be resorted to.

The first essential is to practice a systematic rotation of crops coupled with intelligent use of commercial fertilizer to insure that the land intended for potatoes is amply supplied with the various food elements required by the growing plant. A rotation embodying a cleaning crop, a nurse crop and a leguminous or fertilizing crop, such as for example, potatoes followed by grain then clover for a season, provides a system of cropping which furnishes at lowest cost the nutrient elements specially required by the potato plant. The clover sod, in addition to supplying humus which provides organic matter and nitrogen in very available form, creates a looser soil which is most suitable for potato production. Moreover, the decayed vegetable matter and humus thus created acts as a medium which retains moisture rendering the same available during periods of dry weather when most required by the growing plant. The practice of a proper rotation also materially decreases the possibility of infection by scab, rhizoctonia and certain wilts by eliminating the causal organisms of these diseases which can exist in

soils continuously planted with potatoes. In addition to green manuring with clover to improve soil conditions and render available plant food, commercial fertilizer should be judiciously applied to insure an adequate supply of food materials such as phosphoric acid and potash, particularly, which become readily exhausted by continuous cropping with potatoes. The amount will depend largely on the character of the soil and the availability of plant food in it. In New Brunswick 1500 to 2000 pounds of commercial fertilizer (5-8-7) is recommended. Considerable caution should be exercised when applying commercial fertilizer to insure that the chemicals do not come in direct contact with the seed pieces which may destroy the eyes or materially retard their germination. The use of fertilizer distributors which introduce the chemicals into the soil at the sides of the drills is recommended in view of this danger.

The potato thrives best in a loose, rich, deep, warm, friable soil. It is extremely important that land intended for potatoes should be well prepared before planting. Spring plowing for this crop is considered best, but where rather stiff, heavy soil has to be used, fall plowing may be preferable as the action of frost upon it will aid in loosening it. Different methods for preparing the land in the spring will be necessary for different types of soils. However, it is absoluetly essential that the land should be brought into a thoroughly pulverized condition to a depth of about six inches, insuring especially that any manures added are thoroughly incorporated into the soil. Neither rotted or fresh manures should be placed directly in contact with the seed pieces in the drill because such a practice favors the development of scab. When a planter is used, the soil should be plowed, carefully harrowed and then rolled just previous to planting.

The optimum planting time will vary according to the locality, depending largely on the condition of the soil and spring frosts. Planting in cold wet soil should always be avoided because such conditions retard germination and predispose to rotting of the seed pieces as well as favor the development of diseases such as rhizoctonia which cause destruction of the emerging sprouts.

Treatment of the seed with formalin, corrosive sublimate and organic mercury compounds before planting for the control of tuber-borne diseases such as blackleg, scab and rhizoctonia, is highly recommended. It must be borne in mind, however, that such treatment will not always prevent the development of scab and rhizoctonia if the causal organisms of the same are already in the soil. It will, nevertheless, preclude introduction of such pathogenic organisms into soils from which these may be absent.

Distance of planting is important, 10 to 12 inches being recommended, for experiments have proven that with such spacing

intervals a larger quantity and better quality of tubers commensurate with the average standards for certification are produced. In addition, such close spacing distances decrease the possibility of the development of hollow heart, which has proven an undesirable limiting factor in certain potato growing regions.

Distance between the rows is also an important matter. Distances less than 30 inches do not afford sufficient growing space for the potato plant and enhance the possibility of injury during cultivating operations. Distances in excess of 30 inches utilize unnecessary space and do not increase the yield to an appreciable extent.

After planting, cultivation of the crop is very essential. All previous efforts such as preparation of seed bed, etc., will be valueless without subsequent systematic cultivation of the growing crop to control weeds and retain soil moisture. Uncultivated soil favors the former and eliminates the latter. Therefore, every effort should be put forth to continue careful cultivation with suitable machinery until there is danger of injury to the vines and roots.

Recognition of the cultural practices briefly set forth will more than compensate for the time and money expended by improving the quality and augmenting yields from potato crops thus attended to.

Spraying and Dusting Potatoes

KARL FERNOW, New York State College of Agriculture, Ithaca

Much has been written and more said about the question of whether we should spray or dust. From time to time new reports of experimental work appear but these usually contribute little to the solution of this question. Nor can we hope that further experimental work will do so. It is profits we ultimately are interested in and from this standpoint the question can be subdivided into two phases:

1. How much increase in yield can we get from each method?
2. How much must be paid a bushel for this increase with each method?

If the cost for each bushel is markedly different it will be easy to decide the question. If the cost is only slightly different we will let our personal inclinations sway our decision.

Let us take the first question and see what results have been found by experimental methods.

In Maine Bulletin 334 results are given of spraying and dusting experiments in 1922 to 1925. In different years spraying caused increases in yield as high as 94 bushels an acre and losses

as great as 58 bushels an acre, but on the average the gain was near 15 bushels. Dusting appeared somewhat less efficient as judged by the appearance of the vines but produced about the same increase in yield.

Cornell Bulletin 451 gives the results of spraying and dusting experiments in 1920 to 1922 on Long Island and in Washington County, New York. In Washington County, conditions were such that only very slight increases were obtained. On Long Island spraying gave an average increase of about 80 bushels an acre and dusting about 76 bushels.

Michigan Technical Bulletin 72 gives the results of three years spraying and dusting experiments. In one year there was a bad attack of leaf hoppers and spraying gave an increase of 77 bushels while dusting gave only about 46 bushels increase. In the other two years the plots were relatively free from diseases and insect pests and neither method gave a marked increase although the spray seemed slightly better than the dust.

In Ohio Bimonthly Bulletin Vol. 11, No. 4, the results of spraying and dusting for 1924 and 1925 are given. In 1924 spraying gave an increase of 106 bushels while dust gave only 43 bushels increase. In 1925 the increase from spraying was 60 bushels an acre while that from dusting was 72 bushels. In two former experiments fresh mixed dust gave markedly better results for leaf hopper control than did commercially mixed dust.

Wisconsin Research Bulletin 82 gives results of spraying and dusting for 1922 to 1925. This includes two years when leaf hoppers were severe and two in which there was little disease and insect trouble. On the average spraying gave an increase of about 32 bushels an acre and dusting about 27 bushels.

It will be noted that results vary considerably in different sets of experiments. This probably is due in part to differences in the local conditions, but no doubt the machinery, timing, quantity of material and care used by the operator had much to do with this. It is easy to see why we cannot give a definite answer to question No. 1 and why we never will be able to do so. In general, however, such experiments seem to show a decided increase in yield from the thorough application of fungicides. In most cases spraying gave results very slightly better than dusting but the difference in most cases is not enough to be a deciding factor.

Comparative figures on the cost of spraying and dusting vary almost as widely as yields. Here again there is no definite answer.

In Maine Bulletin 334 the cost of spraying is given as $11.07 an acre for six applications and that for dusting $15.81. Michigan Technical Bulletin 72 gives the cost of six applications of spray $14.93 and of dust $31.32. Cornell Bulletin 451 gives the estimated cost of spraying 25 acres as $38 60 an application and

of dusting with home mixed dust as $49.85. With commercial dust the cost is estimated as $93.70. Wisconsin Research Bulletin 82 gives the cost of four applications of spray as $11.26 and of dust as $11.97.

During 1926 and 1927 we have been able to get quite accurate figures on the cost of spraying in the case of spray rings conducted in Monroe County, New York. There have been a considerable number of these rings and it is noteworthy that the cost has not been materially different in the different rings. Usually the rings are composed of six to ten growers. These men buy a sprayer and hire a man to run it for the season. The only items not included in the following list of expenses are the labor of the grower in preparing stock solutions of lime and copper sulfate and the value of the horse labor. The following list shows the expenses of one of these rings which is representative of the whole group. In 1926 five sprayings were made on 60 acres and in 1927 six sprayings were made on 80 acres.

	1926	1927
Depreciation of sprayer	$ 96 50	$ 43.40
Interest	15.00	8.68
Repairs and parts	13.00	53.75
Labor	149.38	227.00
Copper sulfate	160.65	234.00
Arsenate	93.75	63.24
Lime	47.85	37.20
Miscellaneous	13.30	47.00
	$589 43	$714.27
Cost per acre per application	$ 1.966	$ 1.48

Similar figures on the cost of dusting are not available. However, it is probable that all items except labor and materials would be very nearly the same. If we assume that the labor will be one-third as great and that 200 pounds of dust will be required for six dustings and 175 pounds for five dustings and that dust will cost us 8 cents per pound, we may estimate the cost of dusting an acre for each application to be $4, based on the 1926 data, or $3 based on the 1927 data. If home mixed dust is used the cost may be reduced considerably.

There are certain advantages of the dusting method not taken into account in the above figures such as independence of water supply, greater convenience of application, etc. Just how much value can be assigned to these will depend on the attitude of the individual.

Whether dust or spray is used, it is essential that a thorough job be done. Attention must be given to all details. A poor job is often worse than none at all.

Dusting and Spraying Early Potatoes in Eastern Virginia

H. H. ZIMMERLEY, Virginia Truck Experiment Station, Norfolk

The old-time slogan, "Watch my dust," is still a timely expression during April and May in the potato fields of Tidewater Virginia. In the not far distant past this may have been more applicable in August and September to the clouds arising behind the grower's auto purchased with the proceeds of the potato crop. It is now more pertinent to the clouds of arsenicals sent on their work of destruction to the insects feeding peacefully on the potato plants. "Well Dusted Fields" and "Dustless Roads" is now our motto. Each spring over a million pounds of "bug poison" is blown around and above the potato vines on 90,000 or more acres, and each year many miles of concrete road are laid on the main arteries through this area.

Spraying potatoes with liquid is so nearly an obsolete practice in this section that the sprayer is about to pass into antiquity along with the long skirts and horse drawn carriages. The practice of dusting has superseded the use of liquid sprays because the former method is quicker, more convenient for large acreages and equally effective for insect control on the potato crop. Up to the time of introduction of the modern type duster into this section in 1920, many of the larger potato growers applied the insecticides in liquid form. It was not unusual for a grower to use as much as 8 pounds of calcium arsenate or arsenite of zinc, and one pound of Paris green, to 100 gallons of water to insure quick action against the larva of the potato beetle. In order to "speed up" the spraying process the sprays were often mixed in the spray shed and transported to the field in tank carts equipped with the tank elevated to such height that the liquid could be quickly run into the sprayer which never left the field between sunrise and sunset.

This equipment was used also in spraying with Bordeaux mixture. The practice of applying fungicides to the early crop has since been discontinued. Recent experimental evidence and the experience of the commercial growers who left untreated check plats in their fields have shown that treating the foliage of the early potato crop with a fungicide in either dry or liquid form is seldom profitable. "Early blight" usually appears after the potato vines have made a large growth and are practically mature and apparently does not seriously interfere with the elaboration and storage of carbohydrates. Frequently the potatoes are dug while the tops are still green. No increase in yield due to spraying with Bordeaux or dusting with copper lime dusts occurred even when harvesting was delayed until all vines were dead. Late blight (Phytophthora infestans) does not attack the early crop in this section.

This reduces the problems of dusting and spraying to those

of insect control. The Colorado potato beetle in both adult and larval form, and aphids, are the only potato insects of economic importance which can be controlled by dusting or spraying. Since the potato beetle larva is an annual offender its control is as much a part of the regime as is planting and cultivation. Calcium arsenate either in pure form or mixed with hydrated lime is the most popular insecticide, but large quantities of commercially prepared mixtues containing Paris green are also used. The popularity of the latter is due to the fact that many potato growers are so desirous of securing quick results that they are willing to pay a high price for material and also risk burning the potato foliage. The more quickly acting insecticides with a high Paris green content may be preferable in seasons of frequent rainfall in order that the larva may secure a lethal dose before the poison is washed off the leaves by a heavy rain; or when treatment has been delayed until part of the foliage has been consumed by the insects. The department of entomology at the Virginia Truck Experiment Station recommends calcium arsenate because it is safe, cheap, and effective. In experiments conducted at this station a mixture of equal parts of calcium arsenate and hydrated lime applied at the rate of ten or more pounds per acre proved very satisfactory. This mixture gave equally as good results as pure calcium arsenate at a much lower cost. Dilutions of as high as 3 parts of lime to 1 of calcium arsenate were also effective if applied when the larvae were small.

Dusting or spraying for the control of aphids is not widely practiced in this section because of the following reasons:

(1) Dusting with nicotine dust gives satisfactory results only at temperatures above 70°F. Frequently outbreaks occur during periods of cool weather in May.

(2) It is difficult to secure a high per cent "kill" by spraying if the vines are large and very few growers are equipped for spraying.

(3) Heavy rains accompanied by high winds are often effective in eradicating most of the aphids. Frequently the growers postpone dusting because of the expectation of a heavy rain, until the crop is injured too severely to warrant treatment.

(4) The expense for materials and personal supervision required deters many of the more extensive growers from dusting or spraying for aphids unless the infestation is exceedingly heavy.

(5) Treatment during dry weather after the plants have been seriously injured is seldom profitable

The recommendations of the Virginia Truck Experiment Station have been essentially as follows: (1) Dust with 3% nicotine dust on a warm day, using the proper arrangement of outlets for effective distribution and a cloth trailer 30 feet long behind the duster. (2) Dust before the potato leaves are badly curled. (3) Use 20 or 25 pounds of dust per acre at one application. (4) Make two applications in opposite directions the same day, if one does not prove effective.

Some Important Diseases of the Potato in South Carolina

W. D. MOORE, Plant Pathologist, Clemson College, S. C.

Since the advent of the boll weevil, cotton growing in the coastal section of South Carolina has been gradually superseded by truck farming until it is now of little importance as a commercial crop. The necessity of a radical change in agricultural crops over a comparatively short period of time natually invited a profusion of possible substitutes and, the soil and climate being ideal, the potato was one of the first to receive attention and to prove successful. There being no established cultural practices for potato growing, it was natural that widely divergent ideas would enter into this new industry in its genesis with the consequent result that very few men followed the same plan of work. This condition prevented any concerted action at first in determining the vital factors in crop production, but time and experience have brought potato growing to a point where it is now one of the highest paying per acre crops that is grown in the state. Evidence of this is seen in the expansion of the industry from a very small beginning in Charleston County to an acreage of approximately 20,000 embracing ten of the seaboard and coastal plains counties.

The production of potatoes in South Carolina has not been and is not accomplished without careful study of its many problems and even now heavy losses are sustained each year by several of the well known parasitic disease. Up to 1922 only casual interest was taken by the average grower in seed stock. Through the experience of the more progressive growers and through extensive tests by the county agents, the amount of certified seed used in Charleston County began to increase. The yields increased in the same proportion and today practically all of the seed that is planted in the coastal section is either certified or selected seed. This has naturally reduced mosaic, leaf roll and spindle tuber to a minimum and has resulted in a superior grade of stock for the market.

The good results shown by the use of high quality seed have stimulated interest in seed sources The Cobbler being the principal variety grown in the state, the growers have looked to Maine and New York for their best stock in the past. Now, however, a considerable amount of Prince Edward Island seed is being used. The three factors looked for in all seed stock are earliness, poductiveness and freedom from disease.

Even though the virus diseases are fairly well eliminated through the buying of certified seed, the South Carolina farmer has an enormous problem with the surface-borne diseases such as rhizoctonia and scab and also with blackleg and seed-piece de-

cay. From the standpoint of production, rhizoctonia is probably the most important of all the diseases mentioned. It causes serious losses in stands and produces a large percentage of weak plants and proportionate amount of No. 2 and No. 3 potatoes. Scab is of importance only locally where lime applications have been made frequently and the soil reaction raised to a point near neutrality. The average coastal soil reaction will range from PH 5.2 to 6.2. In addition to this the organic content of the soils is very high, consequently scab has not and will hardly become a serious factor in potato production in this state. Blackleg occurs at times in a serious form but such outbreaks are always traceable to poor seed. As a usual thing this disease is not of serious importance. Southern bacterial blight occurs in practically all fields in a limited way but does not seriously cut the yields. Seed-piece decay in the soil is one of our most important troubles, causing at times total losses within a very few days after planting. This is a problem that has not been thoroughly studied in the south and is one that should receive considerable attention in the future.

It is only within recent years that the South Carolina farmer has come to appreciate the value of seed treatment in controlling some of the above mentioned diseases. Seed treatment work in this state has consistently given more than a 10 per cent increase in yield. A decided turn has been taken by the farmers towards this work and while there is much to be done yet, the acreage now being treated is a significant testimonial to the value of the practice.

Foliage diseases, other than mosaic and leaf roll, as referred to above, are of minor importance to the South Carolina potato grower. Early blight is quite common but seldom becomes important enough to warrant attention. Late blight is an exceptional rather than a common trouble in this state. During the last five years the writer has failed to find an instance of late blight trouble. With these more or less ideal conditions prevailing, the advisability of spraying or dusting with a fungicide becomes questionable. In fact, the average farmer prefers not to have his vines kept green by an application of copper for his crop can not be held over for any length of time because, in many cases, a difference of five days in digging means either a profit or a loss on his whole operation.

Looking at the potato industry of South Carolina from the standpoint of economics of production, one can see a steady trend toward the highest type of farm operations. The men are keenly interested in controlling all types of parasitic diseases; they are extremely careful in buying their seed; they are conducting extensive tests on fertilizers of all kinds; they are studying various cover crops with which to improve their lands; they are grading and standardizing their packages; and they have one of the strongest marketing organizations in the south at Meggetts,

South Carolina. With this concerted and intelligent action back of the potato industry in this state, it seems logical that it should continue to grow and to play a larger part in our new scheme of diversified agriculture.

Irish Potatoes for Georgia

ANDREW M. SOULE, President, Georgia State College of Agriculture and the Mechanic Arts, Athens, Ga.

The records indicate that the American people consume between four and six bushels of Irish potatoes per capita each twelve months. We are credited with growing about 1,500,000 bushels here in Georgia to supply the needs of 3,000,000 people. At the present time, we are growing about two pecks of Irish potatoes per capita. Does anyone suppose for a moment that we do not consume more than this amount? While Irish potatoes are not as generally used and appreciated in the south as in some other sections of the country, they still constitute one of our standard food staples and they are used whenever available in most homes at least once a day. In our towns and cities they are more extensively used probably than in the open country. In any event, it is safe to say that we consume at least two bushels of Irish potatoes per capita and that our crop should therefore be predicated on the basis of a 6,000,000 bushel yield. This of course does not leave any of them available for export from the state. Undoubtedly, Georgia should hasten to participate in supplying the balance of the country with several million bushels of this delectable vegetable. My reason for making this statement lies in the fact that we can grow as fine a quality of Irish potatoes in Georgia as can be produced anywhere else in the world. I know this to be a fact, because I have had an opportunity to grow this crop in six different states and under widely varying climatic conditions. Irish potatoes produced in Georgia will not only cook acceptably, but the crop is relatively free from disease, and the tubers possess long-keeping qualities. This is a very important and desirable thing.

Of course I need not recite the fact that the experience of many of our Irish potato growers in the past has not been satisfactory nor reply to the argument that there is no market for this crop here or elsewhere. It is generally conceded that we make the fundamental mistake of dumping Irish potatoes into a few consuming centers of food products, thereby creating a great congestion at certain seasons of the year. As a result, the prices are unsatisfactory. There is no reason, however, why we should

do this, because with proper equipment, which can be provided at reasonable cost, we can keep the surplus of our Irish potato crop for a long period of time and place it on the market as it is needed at remunerative prices to the grower. Today (Mar. 5), I have eaten Irish potatoes dug out of my garden last June. They are of the Cobbler strain. They were placed under the basement of my house on an area of cool dry earth. There is a very good circulation of air, and it has been necessary to sprout these potatoes four or five times, as often in fact as incipient eyes developed. The surface of the potatoes, however, has remained perfectly smooth. The skin is as fine, soft, and silky as it ever was. The color is good, and the appearance of the tubers attractive. They bake to perfection after having been kept out of the earth for six months. Truly, it is a remarkable thing that this tuber can be kept in such excellent condition for such a long period of time with so little effort and at so slight a cost. If this has been done so satisfactorily in a small way for the last eighteen years, there is no reason why it cannot be done in a big way during the next eighteen years.

Why should Georgia not become, therefore, one of the great Irish potato producing centers of the United States? The answer is simply the lack of appreciation at present of the possibilities of this crop. What we need is initiative along this particular line. Nothing else is necessary save the seed, for we have the soil and climatic conditions at our command, and the storage houses needed can be provided quickly and at a very low cost. Think about having six months in which to market a crop otherwise regarded as a perishable. I would not advocate the average producer trying to hold his potatoes for any such length of time, but it would be the easiest thing in the world for him to keep them in a proper storage house and market them at any time during the months of July and August. This is the season of the year when there are comparatively few potatoes on the market. The crop harvested in the higher altitudes and in the north is not available for general shipment much before September 1. The crop in the southern areas is on the market as a rule by the first of July. In the south alone, 35,000,000 people eat Irish potatoes during the months of July and August. It takes a lot of them to supply their needs. Yet one never goes into a hotel or a restaurant without being offered this vegetable more frequently than any other in the whole category of those which are edible. Where do they come from? They come from everywhere outside of the south. They therefore represent a drain of gold going out of the south continuously for a food product which can be grown therein in unlimited quantity. What is the matter with us? Nothing, except a failure to appreciate this golden opportunity and to make the most of it.

There is one rule for success with Irish potatoes; that is, to plant the crop early. In south Georgia, planting should be done in December and not later than the 15th of January, in any event.

In the Piedmont section, planting should be done from January 1 to February 1. If the crop can be gotten into the ground by January 31, so much the better. Of course, in the mountainous regions of north Georgia, later planting may be followed. Second crop Irish potatoes should be planted from June 15 to August 1. The earlier the better. While I should like to see the cultivation of second crop Irish potatoes encouraged, I do not think this crop offers the profit or possibilities to the grower that the early crop possesses, and I should prefer to concentrate my efforts on the production of an early crop, because one can realize a much larger return from it and can hold the potatoes in storage and sell them in the manner which has been suggested above. Irish potatoes should be planted on well drained land of good quality. Thin lands will not mature a satisfactory crop. An ample amount of high-grade fertilizer should be used. Put it under the drill row before the beds are made. Mix it well with the subsoil. Use anywhere from 700 to 1000 pounds of a formula containing 4 per cent nitrogen, 10 per cent phosphoric acid, and 4 per cent potash. On heavy, clay lands, 8 per cent phosphoric acid and 3 per cent potash may answer very well. On extremely sandy areas, use 5 per cent potash and 12 per cent phosphoric acid. As a rule, the crop should be laid down in four-foot rows, and the potatoes should be left about eight to ten inches apart in the drill. Cover to a depth of six inches. Personally, I favor cutting the seed and leaving two eyes to the piece. A peck of potatoes will plant 200 feet of drill. A bushel planted in an ordinary garden should go a long way toward supplying the need of the home for several weeks. Under field conditions, it will take from seven to ten bushels of seed to plant an acre. Only sound, clean seed should be used. This is a matter of the utmost importance. As a rule, the early crop potatoes will not need to be sprayed to protect it from blight. Should this become necessary, however, the procedure is not difficult. It will take this crop from 60 to 90 days to develop. In other words, it is a relatively short-season crop.

As to the varieties to use, there is nothing in my judgment equal to the Irish Cobbler. Next would come the Bliss Triumph. Then, probably, the Early Rose and the Lookout Mountain for late planting. When the Irish potatoes begin to sprout, the top of the ridge on which they lie should be knocked off with a harrow. Rapid, clean cultivation should be followed. Sometimes side applications of fertilizer are advised, though I rather doubt the wisdom of this practice. In the event this plan is instituted, I would put on about 200 pounds per acre of the same formula as was used under the drill row. Make these applications about two weeks apart You cannot make more than two side applications with profit. The rapid and clean cultivation of the crop is a matter of fundamental importance. The Irish potato loves a moist soil, fairly well supplied with vegetable matter. The frequent stirring of the surface of the ground tends to conserve

moisture and hence insures the rapid growth and development of the crop.

As soon as the tops begin to die and the skin of the potato sets on the surface, digging may begin. Too early digging is to be avoided, because any abrasion of the skin tends to develop a diseased condition. Getting the crop on the market just at the right time of course is a great desideratum; but little will be gained by digging the potatoes so soon that the tubers will present a ragged and unkempt appearance when forwarded to consuming centers. When the potatoes are to be gathered and stored according to the plan outlined in the beginning of this article, digging should be delayed until the crop is thoroughly mature. The work should then be done on a clear, bright day. The potatoes should be exposed to the sun for a few hours. They should then be picked up and sorted. Only firm, clean tubers should be stored. Do not place them in too deep layers. Put them in a dark, dry place, and provide for a good circulation of air. Get as low a temperature as possible. A cellar dug into the earth and provided with proper ventilation constitutes an ideal place in which to hold a crop of Irish potatoes for a period of from thirty days to three months.

There is an opportunity for the growth of the Irish potato in a commercial way in Georgia that has never been appreciated up to the present time. There is no reason why Georgia farmers should not supply an abundance of this crop to other and less favored sections. They can be made available for home use in the Piedmont section by the first of April. They constitute one of the most wholesome and desirable vegetables. Their use in the dietary is therefore to be commended. Most of our people are suffering from eating too restricted a ration, including too much meat. If they will simply plant from a peck to a bushel of Irish potatoes at the proper season, they can have an abundance of this delectable vegetable for the use of the family during the late spring and early summer months.

Progress in Seed Certification

WM. H. MARTIN, Agricultural Experiment Station, New Brunswick, N. J.

Fifteen years ago the first seed potatoes were certified. No record of the number of acres certified in 1914 is available but in 1917 only 2,000 acres were certified in the United States as compared with over 30,000 acres in 1926. Not only has there been a marked increase in the acreage certified but there have, likewise, been numerous changes in the regulations governing certification. This service has now assumed a role of considerable importance to the potato industry. Without certification

there is little question but that the average potato yields rather than increasing from year to year would have decreased. It is interesting to consider briefly some of the changes which have come about since seed potato certification was first started.

In 1916 Barrus of New York reported that seed potatoes were being certified in eight states, a decided contrast to 1927 when 22 states were offering this service to their growers. In 1916 there was little agreement among the states regarding the regulations governing the service. In some states three, and in others, two inspections were made. While most of the states mentioned varietal purity as one of the requirements of certification, it is interesting to note that Vermont and New York permitted 10 per cent varietal mixture, Maryland allowed five per cent, while in California the tolerance was 250 hills per acre. These requirements are in decided contrast to those now in force, 0.25 per cent being the extreme limit in most states. In the case of fusarium wilt some states permitted a tolerance of 10 per cent in 1916 while at the present time two per cent is the greatest tolerance and most states permit only one per cent or less at the second field inspection.

The limit of tolerance in the case of the virus diseases has likewise been greatly reduced. In 1916 as much as 15 per cent of combined diseases was allowed at the first and 10 per cent at the second inspection. At the present time only two states permit a total of ten per cent of all vine diseases. Of the other twenty states, 16 allow a total of only five per cent of all disease at the second inspection.

It is clear that the tendency in seed potato certification has been toward more rigid standards. This has unquestionably resulted in an improved product. That day has passed when it is necessary to sell to the potato growers the advantages of planting certified seed potatoes for maximum crop returns. Certification is no longer on trial—its value has been fully demonstrated. Now and then cases are reported where certified seed does not come up to expectations. This is to be expected. Taken as a whole, certified seed will yield better than non-certified. Sufficient figures are available in all of the potato growing sections to substantiate this claim. The comprehensive report by Moore in the 1924 Annual Proceedings of the Potato Association is sufficient evidence in support of this statement. He reports a total of over 11,000 comparative tests of certified and non-certified seed conducted in 27 states with a yield increase of 46.4 bushels per acre in favor of the certified seed.

The purchasers of seed potatoes have in many cases come to realize the advisability of planting only certified seed. In New Jersey, for example, less than five per cent of the acreage prior to 1921 was planted with certified seed. In 1923 less than 20

per cent of the seed potatoes used for planting the crop were certified. In 1925 this had increased to 75 per cent while in 1927, dealers handling 95 per cent of the seed potatoes sold in Central Jersey reported that over 95 per cent of the seed sold by them was certified. This same tendency is noted in other potato growing sections but in general the percentage of certified seed planted throughout the United States is much smaller than it should be. In the past the reluctance on the part of some growers to purchase certified seed has resulted from the fact that they were not always certain of what they were getting. With the improvements in the certification service the past years there is no longer any reason for this attitude.

In this connection it is of particular interest to note that the various states certifying seed potatoes are each year attempting to improve their product. Each year brings modifications of the regulations, the standards are becoming more rigid and consequently it is becoming increasingly difficult to have seed potatoes certified. Within recent years, for example, most of the states have required the seed growers to furnish a sample of their crop for test purposes. These various lots are planted side by side and any showing more than a certain amount of disease are not accepted for certification. Still other states are sending samples of their seed to the southern states in order to test them for freedom from disease. At the present time, also, seed plots are required in most of the states and as an additional precaution all potatoes entered for certification must be isolated from other fields of potatos which show diseases in excess of certified seed. These precautions are certain to result in a higher quality product.

The present tendency in certification is more than ever toward uniformity of product. At the meeting of the Potato Association of America, the following standards were submitted for the approval of the various states.

	First Field Inspection Per cent	Second Field Inspection Per cent
Combined degeneration diseases	5	4
Black leg	1	1
Fusarium wilt	2	1
Combined diseases	6	5
*Weak plants	3	2
Varietal mixture	2	0.25

*By "weak plants" are meant plants which appear to be affected by a virus disease. Small plants are not necessarily weak.

The response to this recommendation has been extremely gratifying. At the present time, of 22 states reporting, seventeen have standards which meet those suggested. It is entirely possible that a state with high standards might not produce

seed of as high quality, regarding freedom from disease, as another state with relatively low standards. It is equally possible that two states with similar standards may not produce seed potatoes of the same quality. There is not question, however, but that each state certifying seed potatoes is endeavoring to produce high quality seed. While it would be impossible to say that certified seed potatoes are now a standard product, we are safe in saying that we are nearer uniformity than at any time in the past.

We cannot expect to have the uniformity in seed potatoes that we have in shoes, soap or sealing wax. While absolute uniformity is out of the question it is only fair to the buyer as well as the grower that we have some uniformity of standards. It is unfair to ask the seed growers of a state having high standards to compete on the same market with growers from an adjoining state having low standards. It is likewise unfair to the purchaser. In the minds of the average potato growers the term "certified seed" has come to have a definite meaning regardless of whether the seed he purchases comes from Maine or Wisconsin or any other state. When he purchases certified seed he rightfully expects a superior product. No state has a monopoly on seed growing—good and bad seed potatoes can be found in any potato growing section. Through certification it is expected that the bad seed will be weeded out and the purchaser should have the assurance that the seed he buys is free from diseases, the presence of which are likely to result in serious reductions in yield.

The future of the certified seed potato industry lies in the hands of the authorities in charge of the work in the different states. In order that the industry as a whole be improved, state lines must be forgotten and a drive made to further improve the quality of certified seed. Much has been done in the past but still more improvement can be made in the future.

The purchaser of seed potatoes likewise can help improve the certified seed industry. As in every other worth while project there are those who endeavor to misuse the term, "certified seed potatoes." Bogus certification tags have made their appearance from time to time. An effort is being made by the Potato Association to eliminate this evil. In the meanwhile, the buyer of seed potatoes should be on the lookout for imitations. Purchase seed bearing the official tag of the state in which the seed was grown. A sure sign that a product is worth while is evidenced when imitations appear—but in the meantime—beware of imitations. Certified seed has come to stay. In 15 years much has been done toward standardizing the product. More will be done along this direction in the future and the successful potato grower will more than ever see to it that the seed he plants is certified.

Crop and Market News

Shipments Heavy; Markets Weak

(Contribution from the Bureau of Agricultural Economics)

During early June, movement of new potatoes was rapidly catching up with last season's corresponding record, and market prices were declining everywhere. The general situation was weak, with no indications of prompt recovery. Carolina and Virginia potatoes are now dominating the market, and old stock has nearly disappeared.

By the first of the month, South Carolina's weekly forwardings exceeded those from any other state. North Carolina was getting under way, to be followed almost immediately by Virginia and Maryland. Probably the factor most feared by growers and shippers was the inevitable overlapping of active movement from these several sections. Combined output during June was expected to be heavy, with July volume probably less than last year because of the lighter expected crop on the Eastern Shore peninsula. Florida's season continued well into June and delayed digging of South Carolina potatoes to some extent. Alabama was approaching the height of its movement; Louisiana shipments were rather moderate, and forwardings were active

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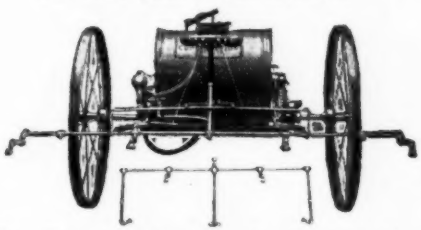

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in the Eagle Lake-Wharton district of Texas. Oklahoma was ready to start shipping by June 5. Arkansas was expected to come along by the middle of the month, followed in late June or early July by Missouri and Kansas.

Heavy Yields in Some States

Heavy yields were harvested in the Hastings section of Florida, some local reports indicating an average of 60 barrels per acre. New records were established for shipments, and average price for the season was rather low. By early June, about 7,500 cars of potatoes had come from Florida, as against 5,400 last year. South Carolina's commercial crop gave indications of averaging around 50 barrels to the acre, and carlot movement may go as high as 5,000 or 6,000 cars, compared with 4,000 in 1927 Heavy rains in the Carolinas leached out a great deal of fertilizer. The North Carolina crop was rather spotted and production uncertain. In spite of increased acreage, the crop in Norfolk section of Virginia was not expected to equal last year's heavy production, though the stand is one of the best in years. Alabama probably will ship at least 2,500 cars, or 400 more than in 1927. Yields in Louisiana were averaging better than last season, but the market situation was rather tense because of the lateness of potato crops in Florida and Texas and the resulting competition with Alabama and Louisiana stock. The lower Rio Grande Valley shipped about 1,500 cars, or nearly as many as a year ago, and output of the Eagle Lake district will greatly exceed the 1927 total, possibly reaching 1,500 cars. Arkansas potato yields will be reduced by the spring freeze, though acreage is greater than last year. Oklahoma expects practically the same-sized crop as in 1927, while Missouri's early crop is in very good condition, and Kansas Production may be normal notwithstanding unfavorable weather earlier in the season. Southern California commercial early-potato plantings are double those of last year, but only a slight increase is reported in northern California. The Shafter crop was active in June.

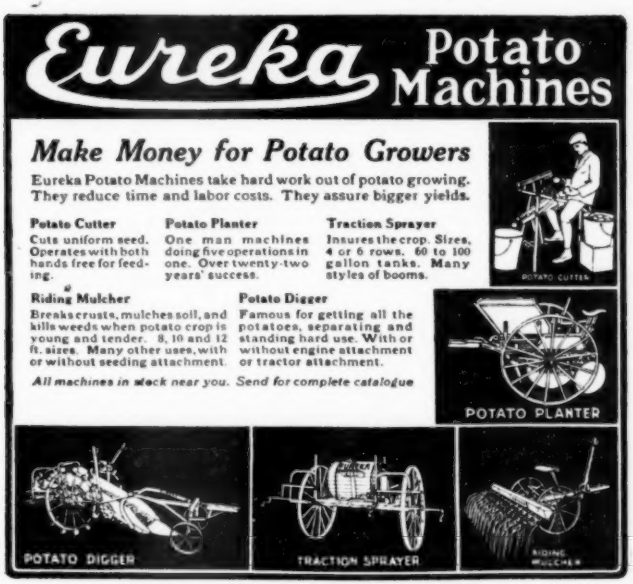
Government Estimates

Official government figures on early potatoes are given below: The commercial crop in nine early states outside of Florida and the lower valley of Texas is forecast at 26,610,000 bushels, or 1,200,000 more than last season. Virginia, with an expected crop of 11,700,000 bushels, may have one-sixth less than last year, but sharp gains are indicated for other states. South Carolina and Louisiana expect 50% increases over 1927. North Carolina may have 5,000,000 bushels. The commercial acreage figure for South Carolina has been reduced to 22,200 acres, as against the original report of 28,000.

Commercial acreage of potatoes in eight second-early states is now estimated at 118,530 acres, compared with 108,540 last season. Heaviest gains appear in Arkansas, Oklahoma, Maryland and New Jersey, though other states show considerable in-

creases. New Jersey may have 47,000 acres; the Kaw Valley of Kansas 18,000, and Oklahoma and Maryland about 17,000 each. The production estimate for this group of states was scheduled for release about June 9, but was not expected to show a total greatly in excess of the 14,400,000 bushels harvested in second-early states last season.

Prices of sacked Bliss Triumphs in the lower Rio Grande Valley of Texas had declined to low mark of $1-$1.25 per 100 pounds by June 1, and southern Alabama shippers were getting $1.50-$1.65. The city market range on southern Triumphs was $2-$2.50, while Florida Spaulding Rose were jobbing at $3.25-$4 and South Carolina Cobblers at $2.85-$3 75 per barrel. Cleveland quoted South Carolina stock as high as $4.25. Quotations on old potatoes were discouragingly low. Shipping points in Maine and Idaho reported a common range of 40c-45c per 100 pounds, and the North Central region had declined to 75c-$1. City dealers quoted Maine Green Mountains at $1.25-$1.90, and New York and Pennsylvania Round Whites at $1.25-$1.50. The Chicago carlot market held nearly steady during late May and early June on northern Round Whites at $1.10-$1.20 per 100 pounds, but Idaho Russet Burbanks had advanced to $1.50-$1 60. The Idaho season was closing with a high record of some 27,500 cars, or 10,000 more than last season. Maine shipped a little more than 40,000 cars, though the crop in that state was estimtaed 5,000,000 bushels less than the 1926 crop. Minnesota's total approxi-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mated 34,000 cars. These three states accounted for more than half the combined output of 200,000 cars in the 19 surplus-producing late-potato states.

Special Report Available

Under date of May 31, the Federal Bureau of Agricultural Economics, Washington, D. C., issued a 9-paged mimeographed summary of the situation, entitled "Early and Mid-Season Potatoes, 1928." This combines numerous statistical tables with a comprehensive text, covering the crop and market prospects for the present season. Most growers in early and mid-season states have been furnished a copy of the report, but if any interested person has been overlooked, he can get a copy of the report from Washington.

Record Potato Consumption for 1927-28 Season

DANIEL GEAN NICHOLS, N. Y.

Reports of carlot movement of potatoes by the U. S. Bureau of Agricultural Economics, together with the reports of potato imports, show that all previous records of potato movement to market have been broken by wide margins. Up to May 1, 1928, the U. S. movement was 252,939 cars, and imports were equal to 5,361 cars more In spite of the efforts of the Bureau of Agricultural Economics there is always a lag in reports by the carriers which will increase these figures by another 2,000 cars or more. The highest previous records at this date of the shipping season were 236,031 cars for the heavy 1924 crop and 238,662 for the record crop of 1922. Imports for these two seasons were light. As nearly 7,500 cars of U. S. stock were shipped in the first twelve days of May, it is probable that all previous records will be broken by 25,000 cars or more. This is in addition to a very heavy truck movement. For many years a large fraction of the crop was marketed by wagon. In recent seasons, trucks have greatly increased the radius of local hauling around our cities. With the high prices of the 1925 and 1926 crop the truck movement jumped far in advance of previous times, and this kept up for 1927. Over considerable areas, as in eastern New York and southern Michigan, the truck has largely displaced railroad transportation, reducing carlot movement to that extent.

The 1927 crop of 402,129,000 bushels, though far below the big crops of 1922 and 1924, was about 48,000,000 bushels over the 1926 yield. Roughly half the increase was located in the northwestern states and half in the early and intermediate states. The line of corn belt and other intermediate states was considerably heavier than in 1926, but that area markets almost entirely by wagon and truck. From Maine through to the Dakotas the northern main crop states actually had less than in 1926, and from Michigan to Maine the shortage was nearly 13,000,000 bushels.

Most dealers have doubted the ability of consuming markets

to use much over 250,000 cars a year. The very low prices of the 1922 and 1924 seasons are often quoted. This feeling was responsible for the low prices of the 1927-28 season up to the February rise, compared with the prices for the 1925 and 1926 crops.

Comparison of the carlot movement to date and probable total movement compared with previous seasons shows that the crop estimate in several states, notably Maine, Minnesota and North Dakota, was either much too low or else the crop was marketed to a closer degree than in either the 1925 or 1926 seasons. Normally we would expect the high price years to yield the largest number of cars in proportion to total yield. It is well known that the low price seasons of 1922 and 1924 compelled growers to utilize their crop to a considerable amount by feeding to livestock. This season's prices have been high enough everywhere east of the northwestern states to make sale for human consumption more profitable than sale in the form of livestock products. As the northwestern states had nearly 80,000,000 bushels, over 28 per cent, of the late crop, compared with only 16 per cent in 1924. that section fed up some of its crop to animals this season.

One reason for the record consumption of potatoes this season was the very high average market quality. From Maine through to the Dakotas there was only one small area in which rot was serious enough to affect market value. Last year saw practically none of the field frost which has been a serious factor in a number of recent seasons. In a number of central and eastern states table quality was better than in recent seasons.

A belief has become very popular in recent years that potato consumption per capita is much smaller than formerly. There is little foundation for this belief in the study of statistics of carlot movement of potatoes to market. Possibly potato consumption fell off a little in the "silk-shirt" era following the war Economists tell us that the low price of potatoes compared with so many other foods makes them sell better in seasons when there is unemployment, as in the past year. It may be that this factor has helped the potato movement for the 1927 crop to break all records.

Notes

CANADA

Early Potato Crop, 1928

The first early potato producing districts in Canada are situated in British Columbia and southern Ontario, where the soil and climatic conditions are particularly well adapted to the production of potatoes for the early markets.

The Dominion Fruit Branch report shows approximately 1950 acres planted in British Columbia, for early shipments, which

Potato Tours and Meetings

Virginia Potato Tour ..... *June 21*
W. O. Strong, Onley, Va.

Seed Potato Certification Conference,
Freehold, New Jersey ..... *June 25 and 26*
W. H. Martin, Agricultural Experiment Station
New Brunswick, New Jersey

Long Island Potato Tour ..... *June 27, 28 and 29*
H. Campbell, County Agricultural Agent
Mineola, Long Island

Michigan State Potato Tour ..... *August 6 to 11*
H. C. Moore, Michigan State College
East Lansing, Michigan

are expected to amount to about 400 cars. The first earlies will appear on the markets about June 10, and full car lot shipments will commence about June 24. The Prairie provinces take the bulk of the shipments offered.

In Ontario, Essex and Kent counties are the first shippers of whole car lots. The estimated acreage planted in these two counties is shown at 4,900 acres, compared with 2,450 acres in 1927, an increase of 96%. Production should exceed 1,000 cars, of which 550 will move in straight car lots, and the balance will be moved by motor truck.

Present indications are for car lots to commence rolling about the middle of July.

Certified Seed Potato Inspection

Applications are now being received for field inspection, and the lists close on June 15. Indications are for an increase of many thousand acres over 1927.

—J. T.

PRINCE EDWARD ISLAND

Present indications point to an increase in the acreage entered for inspection and certification this year. The greatest increase will in all probability be in Green Mountains. Table stock of this variety invariably brings better prices than is obtained for Cobblers.

The month of May to date (22nd) has been unusually dry.

The New Simplified E-Z-Way Seed Potato Cutter

Patent applied for

This cut shows our New E-Z-Way potato cutter, also a sample of the 2-4 and 6 piece cut. It will also make an 8 piece cut. Notice the exact uniformness and exactness of the cuts. No hand cutting can do such uniform cutting. It is not necessary to grade the potatoes according to size, the carrier cups carry the potatoes forward to the cutting head, and the potatoes are cut into the desired number of cuts.

The simplicity of the cutter is apparent to anyone at a glance, and a 14 year old boy can operate it, and two boys can keep more than 2 planters going. Can be operated by crank or ⅛ H. P. Motor.

To insure good healthy stands it is necessary that the seed is fresh cut, full of sap and vitality, and also uniformly cut, so that the planter can do accurate work. This alone insures perfect stands of vigorous plants.

Every year in some section, just as planting begins, it commences to rain, planting is delayed, and in the meantime the seed that has been cut ahead by hand, is drying out, fermenting and losing its vitality, resulting in devitalized stands of spindling plants that never grow strong.

Chas. H. Jewell of Rhinelander, Wis., states that he has grown potatoes for the last eighteen years, and the last eight years nothing but seed for the Long Island, N. Y. market. And that since using our cutters he has had better stands than ever before, owing to the fresh uniform cut seed. Also one cutter will keep two planters going and a 70 acre field will pay for the machine.

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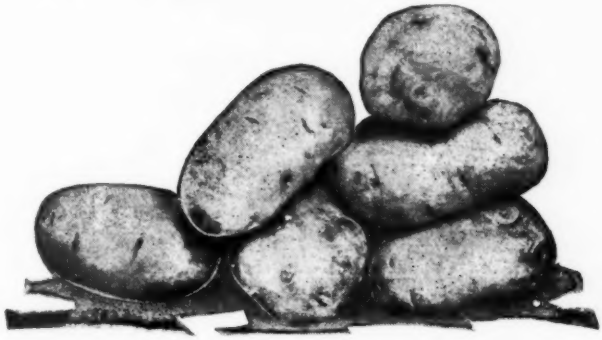

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Also less snow than usual fell during the winter months. On this account our season is much more advanced than in 1927.

Several steamers with fertilizer from Baltimore have arrived for the Potato Growers' Association. Broadcasting the fertilizer prior to planting is the common practice here in our crop rotation. Considerably over 1½ tons of bichloride of mercury has been purchased for seed treatment. Farmers who are unable to purchase this chemical are using Formalin.

A few acres have already been planted and in another week planting will become general. The early season is giving the farmer a better opportunity to more thoroughly prepare the soil than last year. The 1928 crop will therefore be planted under most favorable conditions.

—S. G. PEPPIN.

NOVA SCOTIA

The season of 1927 witnessed an increased interest in the growing of certified seed potatoes in Nova Scotia. From an average of about 210 acres the area jumped to over 620 acres. Garnet Chili, Green Mountain and Irish Cobblers were the chief varieties planted, being in the ratio of 38, 18, and 44 per cent respectively. The market for Garnet Chili is limited to Bermuda, and although 6,000 bushels more than usual were shipped, a small surplus remained in the hands of the growers The Green Mountains produced from seed plots were of excellent quality and all available seed was exported, making the first exportation of certified seed direct to a United States market from Nova Scotia.

Most of the new growers planted Irish Cobblers, but many used seed never previously inspected, with the result that only about 50% passed inspection. With the exception of 1,500 bushels of choice stock shipped to Bermuda, the bulk of Irish Cobbler is being marketed in the province.

—W. K. MCCULLOCH.

COLORADO

A Brown Beauty Potato Contest

The name Brown Beauty is a local name applied to the best yielding potato now grown in the San Luis Valley. This name was given to the potato by Mr. Newton, a truck grower of the Monte Vista district, some years ago, when he assured himself, as he dug eight and ten potatoes, practically all of the same size, from each hill in his patch, that they were veritable "Brown Beauties."

This potato has been grown in the Del Norte district, San Luis Valley, since about 1885. It was brought in by a man by the name of Barkley from the home farm in Cape Breton Island, Dominion of Canada. It was known as Barkley's Prolific be-

cause of its high yielding power. R. A. Chisholm used this potato to plant his measured acre when he competed for the American Agriculturist's $1,000 prize in 1889. He won the prize with his yield of Barkley's Prolific.

The writer has tried to locate that type of potato known as Brown Beauty, grown in San Luis Valley, in other parts of the potato growing world without success. Therefore, if improvement in seed stock is to be made it must be done in the Valley where the commercial crop is being grown. It is the dominant potato now being grown in the San Luis Valley. It is quite a desirable table stock potato both for a baker and also a boiler. Therefore, the San Luis Central and the Denver & Rio Grande Western railroads announce a seed plot contest on Brown Beauty potatoes under the general supervision of the Horticultural Department of the Colorado Agricultural College. This contest is for 1928 and 1929. The first year the area of the seed plots shall be one-quarter of an acre and open to boys and girls of the 7th and 8th grades as well as high school grades. For the second year or 1929 the seed plot shall be at least one full acre. Prizes amounting to $300 are offered in this contest.

—W. H. OLIN.

VIRGINIA

The writer has just returned from the Eastern Shore, and like the growers there feels pretty blue over the prospects for the next few weeks at least regarding the potato market. The delayed harvesting in Florida, South Carolina, and other states south of us will throw much of North Carolina and Virginia crop on the market at the same time. Digging will start about June 11, although a few cars will move before that date.

We have had frequent light rains during the past two weeks and the crop has greatly improved in appearance recently. The decisive period is just ahead of us. Today (May 31) is hot and dry and the crop is already showing need of rain. Should dry weather occur for the next two weeks the yield of the crop would be severely cut and the chances for a fair price later in the season will materially increase. If the crop appears to be short the chances are that many growers on Eastern Shore will delay digging until the bulk of the low priced stock has moved from Norfolk and North Carolina and the prices during the latter part of July and August will increase. If we have a bumper crop, and we will have one if rains are frequent, there is little hope of a profitable market price this season. Delaware, New Jersey, and Long Island growers are advised to cultivate the crop well to keep down the grass for it may be later than usual before they can begin harvesting. In fact, if Eastern Shore has even a normal crop they will move later than last year, for many home-grown seed have been planted.

We are by no means whipped as yet and are hoping for the

weather and appetites of the consuming public to help us. The potato game is a tricky one and sometimes a few weeks makes a tremendous change in prospects. —H. H. ZIMMERLEY.

Two weeks ago the prospects were never better for a record-breaking crop of potatoes for this section. The stand is a little better than normal. However, there are many broken fields largely due to rhizoctonia. Most of this trouble is found on the high places in the fields, in late planted seed and in home grown

At this date (June 2) our prospect has a different appearance. The potatoes throughout Northampton County and lower Accomack are in full bloom, but most of the tops are small and the potatoes are setting close to the main stem. The crop will be short unless rain comes soon. In some sections there has been but little rain this spring. At Onley we have had the following: January 1.04, February 2.85, March 2.17, April 4.55, and May 2.29 inches of rain. Small areas have had a few more local showers. Most of the acreage went into the ground during March. A frost over most of Accomak on May 14 did much damage.

Many predict about half a crop, but a movement of 15,000 cars from this district is a close estimate at this time. A small shipment of potatoes left Cape Charles on May 28 and sold for $5 per barrel. Small lots are following, but regular digging will not start until the week of June 11. —W. O. STRONG.

Review of Recent Literature

McKinley, Bruce—An Economic Study of Potato Farming in the Hastings Area for the Crop Year 1925. Fla. Agr. Exp. Sta. Bul. 193, pp. 177-275, Feb. 1928.

In the author's introduction it is stated that the bulletin presents data regarding production, expenses, receipts and net returns from farms on which the growing of potatoes for northern markets is the chief business. This study was undertaken primarily for the purpose of obtaining information in regard to farm practices, materials used, profits made, and to compile the data in such form as to make it helpful to farmers. The Hastings potato area was divided into the Hastings, Bunnell, Green Cove Springs and LaCrosse districts. Records were obtained from 217 farms in the Hastings district, 50 from the Bunnell district and 14 and 13 respectively from the Green Cove Springs and LaCrosse districts. Potato growing in Florida is said to have had its beginning in the production of potatoes for northern markets in the latter part of the nineties, three miles south of Hastings. In 1902, 15,000 barrels were grown. The potato industry in Florida in 1923 included 19,310 acres, in 1924, 28,000 acres, and in 1925, 21,920 acres. In addition to a large number of tables containing statistical data, there are numerous graphic charts. — WM. STUART.

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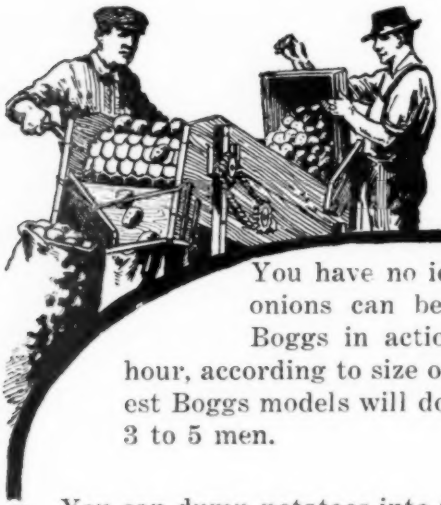

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50.8 12

Making Bordeaux Mixture

O. BUTLER, Agricultural Experiment Station, Durham, New Hampshire

The literature recognizes three types of Bordeaux mixture which may be defined as follows: Acid Bordeaux mixture, a wash so made as to contain a small amount of soluble copper and give a faint acid reaction; Neutral Bordeaux mixture, which is most commonly made by adding milk of lime to a solution of copper sulphate until an alkaline reaction is obtained; Alkaline Bordeaux mixture, any wash containing copper sulphate and quick lime in the ratio of 1:0.5 or higher.

Acid and neutral Bordeaux mixtures are not used in the United States and need not be further considered.

The Alkaline Bordeaux mixtures were defined as those washes in which the ratio copper sulphate to quick lime is 1:0.5 or higher. In potato spraying the ratio ranges from 1:0.5 to 1:1 or somewhat higher depending upon the purpose for which the mixture is to be used, but unanimity of opinion has not yet been reached regarding the ratio best suited for a given purpose. It is important therefore that we should have a clear understanding of the effect of this ratio upon the resulting mixture. In the prepartion of an alkaline Bordeaux mixture much emphasis has been laid upon the method in which the solutions are brought together, and it will be necessary for us to study the effect of method of preparation upon the resulting mixture. In recent years, owing to the difficulty sometimes encountered of obtaining quick lime of the desired purity, hydrated lime has been used in lieu of quick lime and the results secured have not always been entirely satisfactory. Hydrated lime makes as satisfactory a mixture as quick lime in some cases and not in others, and the reasons for the discrepancies in the results secured with it need to be sought.

Let us first of all consider the effect of the ratio copper sulphate to quick lime.

When milk of lime is added to a solution of copper sulphate in amount just sufficient to percipitate all the copper, a blue gelatinous translucent precipitate is formed. A plant sprayed with such a mixture is neither stimulated nor depressed but grows with the same vigor as a non-sprayed plant; when, however, the amount of lime is increased so that we have a ratio of copper sulphate to quick lime of 1:1 the mixture has a depressing effect when all conditions for growth are otherwise favorable. On the other hand there is reason to believe that under conditions unfavorable for growth, lack of soil moisture and hot weather, the mixture will prove beneficial and that the benefit will be increased by the use of Bordeaux mixtures containing lime in greater amount than the copper sulphate. That in fact under these conditions the Bordeaux mixture acts as a shade. The decision as to what ratio copper sulphate to quick lime shall be used in making Bordeaux mixture will depend therefore on the conditions prevailing in the region where the potatoes are grown. If the potatoes are benefited by being shaded then a high lime Bordeaux mixture is indicated, but if shading is not beneficial then the lowest ratio should be used. In the former case it is doubtful if a ratio greater than 1:3 would prove beneficial and in the latter a ratio lower than 1:0.5 is not desirable from the point of view of practice. It has been found that the adhesiveness of a Bordeaux mixture is affected by the ratio copper sulphate to quick lime used. As the ratio is raised from the minimum permissible for complete precipitation of the copper the adhesiveness increases, passes through a maximum, and then decreases. The maximum adhesiveness occurs at the ratio 1:0.5.

Method of Mixing. It used to be believed that the method of mixing Bordeaux mixture was of very considerable importance. In reality the method of mixing is not important. There are just three ways in which a bordeaux mixture should not be made and a number of ways in which the wash can be prepared without deleteriously affecting its physical condition. Pouring the stock solutions together or one into the other are the only methods of mixture that are objectionable, any other method adaptable to spraying practice can be safely used. Perhaps the simplest method of mixing, when milk of lime is used, is to wash the requisite amount of the stock solution of lime through the strainer and filling the tank almost full before pouring in the stock solution of copper sulphate; and when hydrated lime is used to pour the required amount of the stock solution of copper sulphate into the tank, fill with water, and then sift or dump, preferably the former, the hydrated lime into the solution.

It is commonly supposed that the rate at which a Bordeaux mixture settles affects its adhesive properties, but this is,

strictly speaking, not true. A Bordeaux mixture made with water at 50°F. settles very slowly while a mixture made with water at 80°F. settles rapidly, and yet both mixtures adhere equally to sprayed foliage. Under all ordinary conditions no attention need therefore be given to the temperature of the water used in making Bordeaux mixture.

Use of Hydrated Lime. When quick lime is slaked in water we obtain milk of lime which is a saturated solution of calcium hydroxide containing in suspension finely divided calcium hydrate. Upon the addition of milk of lime to a solution of copper sulphate the copper is thrown down as a gelatinous precipitate by the hydrate in solution and forms a gelatinous sheath round the particles of hydrate in suspension. The solubility of calcium hydrate in water being only 1 part in 800 under ordinary conditions the amount of copper precipitated by the hydrate in solution will be considerably less than the total amount employed. In fact in the Bordeaux mixtures used in practice the greater part of the copper is precipitated upon the particles of hydrated lime in suspension. The degree of fineness of the hydrated lime in suspension will, it will readily be conceived, directly affect the buoyancy of the Bordeaux mixture. Likewise the degree of fineness of the calcium hydrate in suspension will affect the thoroughness with which the copper is removed from solution. The copper in one gram of copper sulphate may be completely precipitated by 0.2 gm. calcium hydrate in solution, but considerably larger quantities of calcium hydrate in the form of milk of lime are required to effect the same result. When a commercial calcium hydrate is used in place of milk of lime the Bordeaux mixture formed will settle more rapidly than one made in the usual way but if the hydrated lime is fine the difference in physical properties will not be great enough to affect the value of the mixture as a fungicide. If the hydrated lime on the other hand is coarse the resulting wash will be undesirable and may even approach in coarseness a mixture made from stock solution, that is, settle rapidly and adhere poorly.

When using hydrated lime one must also bear in mind that it is always carbonated at least to some extent. In the presence of this carbonate there lurks a danger. Calcium carbonate is quite inert and of itself will precipitate only about one quarter of its weight in copper sulphate so that when the per cent of carbonate becomes larger there is a possibility of some copper sulphate remaining in solution. However when a Bordeaux mixture is made from a hydrated lime of good quality in the proper proportions, that is when 1.32 parts of hydrated lime are used in place of 1 part of quick lime, the production of a satisfactory wash will have been obtained if the resulting mixture gives an alkaline reaction. An alka-

line reaction should be obtained even when 0.6 lb. of hydrate of lime are employed for every pound of copper sulphate used.

To conclude—an alkaline Bordeaux mixture containing 2 parts of copper sulphate to 1 part quick lime is more adhesive than mixtures higher in lime and is neutral in its action upon the plant, mixtures high in lime have a shading effect upon the plant and are useful whenever shade is beneficial.

The rate of settlement of a Bordeaux mixture is not a measure of its adhesive properties and in making the wash it is not therefore important to stress one method of mixing in preference to others. There is just one thing should never be done and that is mix the stock solutions together.

Bordeaux mixture of satisfactory quality can be made from hydrated lime. The hydrated lime should be used in quantity sufficient to give an alkaline reaction.

Hydrated lime used for spraying purposes should pass a screen test so that 95 per cent or more will pass through a 200 mesh screen. It should have a density of from 65 to 85 cubic inches per pound, and it should analyze 95 per cent or more calcium hydroxide. Chemical hydrate lime or masons lime should be used in making Bordeaux mixture. Agricultural hydrated lime is not satisfactory for spray or dust purposes as it is usually of low calcium content and is too coarse and gritty.

50.820

Relation of Potato Viroses to Yield

J. T. ROSA, University Farm, Davis, California and H. G. ZUCKERMAN, Berkeley, California

While much has been said and written about virus diseases of potato (hereafter to be called "viroses") rather little has been published concerning their effect upon yield. Of course, the effect of the more malignant manifestations of viroses is so marked that it hardly needs discussion—degeneration has proceeded to the point where crop production is practically zero. But on the other hand, we have all seen more or less diseased plants produce a crop. How much better would healthy stock have done under the same conditions? Schultz and Folsom published some data along this line, as a result of their work in Maine. It was considered desirable to obtain some similar data for California conditions, especially on the Stockton peat land area, where very large yields are obtainable. A fairly extensive experiment was carried out in 1927, in colla-

boration with Zuckerman Bros. and A. J. Ruess, on McDonald Island.

A number of tubers of the Pride variety were tuber-indexed at Davis. The segregation of the commoner types of viroses was fairly satisfactory in the indexing, although it was necessary to make a Dukes mixture class of tubers, called "doubtful," the plants of which appeared not to be normal, yet could not be said to have any particular disease. The tubers were classified according to the results of the indexing, so as to give six classes, including the "doubtful" and "healthy." They were planted in replicated rows on the Zuckerman Bros. ranch the middle of April. On account of the prevailing high temperatures, disease symptoms were masked throughout the season. The soil and moisture conditions were good, however, and after the tops died down, the hills were dug by hand. The following table gives the results.

Disease as per index	No. sets planted	Per cent stand	Yield per plant	Yield per cent of 20,000 plants	Per cent loss
Spindle Sprout	375	12.5	.55 lbs.	1,375 lbs.	96.7
Spindle Tuber	117	69.2	1.11 lbs.	15,360 lbs.	62.8
Rugose Mosaic	322	69.0	1.35 lbs.	18,630 lbs.	54.9
Mild Mosaic	524	73.1	1.63 lbs.	23,800 lbs.	42.4
Doubtful	476	67.6	1.45 lbs.	19,600 lbs.	52.5
Healthy	529	82.2	2.51 lbs.	41,300 lbs.	——

The reduction in yield ranged from 96.7% in the case of spindle sprout, to 42.4% in the case of mild mosaic. It is worth recording, that although mosaic symptoms could not be seen on account of climatic conditions, still the yield was materially reduced when tubers known to be infected with mosaic were planted. Furthermore, it should be emphasized that these results were obtained on heavily fertilized soil, with ideal moisture conditions throughout the season. Finally, it may be pointed out that although under these conditions mosaic-infected seed gave yields that might satisfy some growers, yet healthy seed alongside produced more than double the crop.

The nature of the spindle sprout disease referred to in the table, is unknown. It was found in only about 6% of the indexed tubers, and was not limited to any particular type of tuber,—in fact some of the largest and nicest-looking tubers were affected. Generally all the eyes of the tuber were affected, and these sent out very fine spindly sprouts which were mostly unable to develop into plants. Some of the eyes, however, were affected to a lesser extent, and made plants which, although not very robust, still managed to produce some potatoes. This "spindle sprout" trouble has none of the characteristics of Witches Broom or of the Utah Yellows disease, and may not be a virus trouble at all, but rather the result of physiological disturbances within the tuber.

50.812

Potato Spraying and Dusting in Ohio

PAUL E. TILFORD, Assistant Plant Pathologist, Ohio Agricultural Experiment Station, Wooster

In response to numerous requests by Ohio growers for information on the relative efficiency of various dusts and sprays for the control of potato diseases, a series of spraying and dusting experiments was started three years ago in Ohio. Since the space is limited, the complete results of the experiments cannot be given here. However, a part of the results obtained from the 1927 experiments are given in the accompanying table. The results of other tests, which are somewhat comparable to those found in the table are available in the Ohio Agricultural Experiment Station Bi-Monthly bulletin, July-August, 1926; January-February, 1928, and also in Bulletin 417, Forty-Sixth Annual Report for 1926-27.

Results of Spraying and Dusting Potatoes at Wooster in 1927

Treatment	No. of applications	Yield per acre bushels	Increase over comparable checks bushels
4-6-50 Bordeaux*	8	372.7	124.7
4-4-50 Bordeaux	8	355.5	109.1
5-5-50 Bordeaux	8	363.8	113.4
5-5-50 Bordeaux	4	327.6	79.7
Bodo (Com'l Bordeaux)	8	352.2	105.5
Dust, Fresh mixed 20-80	8	347.7	103.2
Dust, Niagara D6	8	333.2	83.5
Dust, Niagara Copodust	8	312.8	69.5

*4-6-50 Bordeaux is prepared by using hydrated lime. 4-4-50 and 5-5-50 is prepared from stone lime.

The results of the various tests justify the following conclusions in respect to the comparative value of the materials used. (1) Bordeaux mixture containing four pounds of blue vitriol to 50 gallons of water is just as satisfactory as a mixture containing 5 pounds. (2) Hydrated lime has proved as satisfactory as stone lime for the preparation of Bordeaux when the amount is increased by one half. (3) A fresh mixed 20-80 copper-lime dust has consistently proved better than the commercial dusts and has given practically as good results as Bordeaux mixture.

Since Ohio growers are showing so much interest in the fresh mixed 20-80 copper-lime dust, the remainder of this paper will be devoted to a discussion of the use of the fresh mixed dust.

Preparation of Fresh Mixed Dust. The fresh mixed 20-80 dust is prepared by mixing 20 parts by weight of monohydrated copper sulphate with 80 parts of hydrated lime. The monohydrated copper sulphate can be purchased in 12½ pound bags. These bags are packed in a metal drum to keep the material from the air. One 12½ pound bag is sufficient to mix with a 50 pound sack of hydrated lime to give the 20-80 ratio. If it is desired to incorporate a poison in the dust for bugs, 10 pounds of the 80 pounds of lime used to make 100 pounds of dust is replaced with 10 pounds of calcium arsenate or arsenate of lead powder.

The simplest way to do the actual mixing is to use a duster equipped with a mixer in the hopper. Such dusters are now on the market. Small lots of dust can be mixed for use with a hand duster in a barrel churn. Revolving the churn for five minutes gives a thoro mixture.

Amount of Dust per Acre. This is one of the most important points to be considered in the use of fresh mixed dust. An avereage application of 40 pounds per acre is neccessary. For the first applications, 20-30 pounds is sufficient. This should be increased until about 50 pounds is applied per application when the plants cover the ground. If less than an average of 40 pounds per application is used satisfactory results can not be expected.

Application of Dust. Fresh mixed copper-lime dust should be applied when there is no wind and when the plants are wet. Usually, the most satisfactory time of the day to dust is from daylight in the morning to about 7:30 or 8 o'clock. During this time the plants are wet with dew and there is usually very little wind.

The most satisfactory duster for the application of fresh mixed dust is one which has a mixer in the hopper for mixing the dust. A fan type of hand duster is satisfactory for not more than one acre. Excellent results, however, can be obtained by the use of such a hand duster in caring for the garden "potato patch".

Cost of Fresh Mixed Dust. The cost of using fresh mixed dust is practically the same as that for liquid spraying. In 1927 it cost slightly less than $2.00 per application per acre to use fresh mixed dust. The cost of liquid spraying varied between $1.50 and $2.00 per acre per application. Commercial dusts cost considerably more.

Number of Applications. The most profitable number of applications of either spray or dust depends in part on the date of planting, fertility of the soil, and seasonal variations in regard to temperature, amount of rainfall and date of the first killing frost. Since it has been shown that May plantings of late potatoes are most productive in central and northern Ohio, spraying and dusting recommendations for the late crop are based on that planting date.

The first application should be put on when the plants are 2-3 inches through the ground. This should be followed with a second application about one week or ten days later. The third application should be put on at the beginning of hot weather in July. Successive treatments should be made at one week or ten day intervals during July and August. With the advent of cooler weather in September the interval between treatments may be lengthened out to two weeks unless weather conditions are such that there is danger of a late blight epidemic, in which case the interval should not exceed one week.

In conclusion it should be stated that the above facts have been worked out under Ohio conditions and that it is not probable that they will hold equally well under all other climatic conditions. Also, while fresh mixed dust has proven very satisfactory in Ohio where the most important injury which can be controlled by foliage protection is hopperburn, it may not be so satisfactory in other potato growing regions.

Rings Get Potato Spraying Done

EARL D. MERRILL, Manager of Monroe County (N. Y.) Farm Bureau

Until two years ago only a small portion of the potato acreage in Monroe County and for that matter in most of the potato sections of western New York were sprayed to control blight. The growers of certified seed and a few of the larger commercial growers were dusting or were following a regular spraying program with good equipment. Most growers owned old sprayers of small capacity equipped usually with one nozzle to the row booms. With this inadequate equipment the potato fields were sprayed or sprinkled for "bugs"; and if late blight appeared a last minute attempt was made with one or two late applications to check its spread. Often growers sold on the idea of spraying would start out with perfectly good intentions to spray regularly through the season, but with the pressure of other farm work, spraying was the first job to be neglected. About once in three years growers took heavy losses from late blight.

An energetic campaign over a period of years by the Extension Service to get growers to spray, resulted in but little increase in spraying. Growers generally admitted that it would be profitable to spray their potatoes, but the job didn't get done.

The farm bureau potato committee and the county agent decided that they were not getting anywhere in their efforts. They believed it was important to get a large part of the

acreage thoroughly sprayed in order to protect the Rochester potato market, which was being invaded by out-of-state potatoes and to help remove the prejudice against Western New York potatoes in other markets.

An analysis of the situation revealed several facts:

1. The sprayers used by most growers were so limited in the pressure and the quantity of materials applied that the results were questionable. Regular applications would often keep fields green but would permit the development of sufficient late blight that the losses from rot were heavy. This tended to discredit spraying.

2. Growers, particularly the smaller growers, due to conflict with other farm work, and due to dislike for the job, were not getting the spraying job done, frequently where they had good equipment.

3. While the gains from thorough spraying would easily justify the investment in a good sprayer, even for the grower with limited acreage, most growers in the face of the economic conditions of the past few years were unwilling to consider buying so expensive a piece of equipment.

4. The lime available was of very poor quality for spraying; and local prices on blue vitriol were high.

5. Flea beetles and leaf hoppers took such heavy toll every year that the increase in yield even in years free from blight well justified the costs of spraying. Growers were slow to accept this fact.

It was necessary to provide a plan that would provide for the thorough spraying at regular intervals of every growers' potatoes, whether the acreage was large or small, that would provide first class equipment and do the job at low cost with the best materials and properly prepared Bordeaux. The spray ring was the practical answer. Details of the Pennsylvania ring plan worked out by Dr. Nixon were obtained and modified to fit Monroe County conditions. Sixteen spray rings spraying a total of 1185 acres are in operation in Monroe County. The organization and supervision of these rings has been one of the most satisfactory projects of the Monroe County Farm Bureau.

Two years ago three groups were persuaded to give the plan a trial. The success of these rings raised the number to 13 in 1927, and this year four additional rings were added.

While the acreage handled in each ring varies from 50 to 83 acres, substantially the same plan has been adopted by each of these rings. Each ring is made up of a neighborhood group

of growers with usually between 60 and 70 acres, the larger the number of members the smaller the maximum acreage that can be sprayed. The number of members in each ring varies from 8 to 17 growers. The acreage in each ring is limited to the amount that can be sprayed six times operating the sprayer continually from July 1st to September 20th and allowing for bad weather and breakdowns.

Each member signed a membership agreement stating what was expected of him and of the ring. A chairman and treasurer were elected, who handled all the business for the ring and supervised the spraying job. A first class traction sprayer with a Nixon type three nozzle to the row boom was purchased by each ring. Each grower owned as many shares in the sprayer as he had acres. The best quality materials were purchased in a county pool and distributed to each member on the basis of his acreage. A competent man was employed by each ring to do the spraying, prepare the Bordeaux and to keep the sprayer in good operating condition. These operators board around with the ring members. Most of the operators have been farm reared students from the College of Agriculture working during their vacation. Each member furnished a team for his spraying and to take the sprayer to the next farm. One ring this year with a widely scattered membership and a small average acreage per farm has decided to hire a team to go with the sprayer. For most rings this is an unnecessary increase in the expense.

The rings were financed by a flat rate per acre to be sprayed. The first year with a sprayer to purchase, $13.00 per acre has been collected. After paying for the sprayer, the materials, the operator, repairs, time of chairman in supervision, and other expenses, whatever has been left over has been refunded at the end of the year on an acre basis. The net cost the first year has averaged around $11.00 per acre. The net cost after the first year has been $7.50. One very successfully managed ring last year kept the cost down to $5.65 per acre, which is certainly much cheaper than any individual grower could hope to do the job. Liberal discounts for cash were obtained on the purchase of both sprayers and materials.

Several things have been done by the Farm Bureau to help insure the success of the plan. A school is held the first of July for operators and ring chairmen to give instruction in the preparation of Bordeaux, in the care and adjustment of the sprayers, in the organization of the job, and in the insects and diseases concerned. A set of financial record forms is furnished each chairman. He is assisted in summarizing these for an annual meeting of the ring in the fall. Each member is required to leave a check of four rows unsprayed except for

"bugs" and to furnish a report on the comparative yields. The results from these checks have kept the members well satisfied and have sold the ring plan as well as the idea of thorough spraying. The operators are visited during the summer by the county agent to iron out difficulties and to insure that the job is being done right and that the sprayer is in good operating condition.

The increases in yield are not striking because the average results are obtained from all the members including good and poor growers. In 1926 with five applications the average increase in yield from spraying based on figures from 19 fields was 57 bushels per acre. Most growers not in the rings in addition to taking this cut in yield found it necessary to sort out from 20 to 50 per cent of their stored potatoes on account of blight rot. Visits to the cellars of ring members revealed no trace of blight rot. Last year potato yields in the county were light on account of dry weather, yet figures obtained from 72 ring members' fields showed an average increase in yield of 42.7 bushels from spraying. In many of these fields no late blight showed up in the check rows. Accordingly, the increase in yield was due to other good effects of spraying. Many ring members sold their crop at a premium per bushel of 10 to 15 cents over the price obtained by their neighbors who did not spray. A large buyer of potates in Rochester stated that in bad blight years he wanted the opportunity to buy exclusively from ring members. He said that he would gladly pay a premium for this stock. Without considering premiums or losses in storage through failure to spray thoroughly, the gain from spraying to the 144 ring members on their 840 acres last year was $36,000 after paying all their costs of spraying.

The gains to Monroe County potato growers from the operation of these rings have not been limited to ring members. The rings have been effective demonstrations of both the methods and value of thorough spraying. There has been a real spraying revival outside the rings. Numbers of the old sprayers have been overhauled and made to give the best service of which they were capable. More good potato sprayers have been purchased in the last two years than in the preceding 10 years. Ring members and others, too, have decided that if they were going to the expense of spraying they ought to spray good potatoes, so there has also been a marked increase in the use of certified or disease free seed; in seed treating and better cultural methods. Monroe County is going to grow better potatoes and grow them cheaper.

Cultural Practices with White Potatoes in the Charleston, S. C., Area

By G. CHALMERS McDERMID, County Agent, Charleston, S. C.

South Carolina, according to recent U. S. Department of Agriculture Yearbooks, produces the largest acre yields of white potatoes of any state in the southeast. Charleston county, the chief potato producing county of the state, leads in acre yields, the average under normal conditions being about 67 barrels or approximately 184 bushels. It may be, that in addition to the influence of the extensive research by the local Truck Experiment Station, the better farm practices followed in this section are in large measure responsible for these high yields.

Years of practical experience with many fertilizer formulas has proved to our growers that a mixture containing 5 per cent ammonia, 7 per cent phosphoric acid, and 5 per cent potash is best for potatoes. Sixty per cent of the ammonia in this fertilizer is usually derived from fish, tankage, cotton-seed meal, castor meal, and dried blood; and 40 per cent from mineral sources, either totally from sulphate of ammonia or from this and a small additional percentage from nitrate of soda. The fertilizer is applied before planting at the rate of 2500 to 2800 pounds per acre.

The potatoes are planted usually 11 inches apart in rows 2 feet 9 inches apart, although many farmers are beginning to space them 12 inches apart in 3 foot rows. Approximately 35 per cent of the planting is done by machine, the rest by hand. The former method, however, is rapidly gaining in popularity. The seed pieces are covered in the furrow with the "middle buster" and the first working of the crop comes about two or three weeks after planting. Subsoil plows are run twice to every other "alley" and are followed with an 18 to 20 inch Farquhar sweep. The following week the same operation is carried on in the remaining "alley." By the time this working is finished the seed pieces are usually well sprouted and a weeder is run over the tops of the beds followed by the same 20 inch sweep or shovel plow. From then on the crop is worked once a week with a 5-tooth Planet Junior or similar cultivator, this being followed each time with the sweep. The size of the sweep is regulated by the root growth of the growing plant. When the potato plant begins to put on a third whorl of leaves the cultivators are dispensed with and the entire cultivation throughout the remainder of the growing season is done with the sweep. The idea is to give the potato crop as many workings as possible while the plants are still small. By April 12th to 15th, the plants have reached good size and all cultivation ceases. The plants at that time are generally "lapping the alley" or very nearly so.

Blossoming is general at this time and the only animals that go into the fields are the teams that pull the sprayers or the dusters.

The writer is a firm believer in the use of spray for insect and disease control and does not hesitate to express his opinion on the subject. Various spraying and dusting demonstrations have proved spraying more efficient and much cheaper than dusting. The majority of growers here are not spraying, yet they are not using the dust in such a way as to get maximum results. A serious outbreak of late blight has never occurred in this locality, but should there be one we are confident that the difference between spraying and dusting will then be demonstrated conclusively. The best argument which our growers use against spraying is that the plants remain green too long and the tubers do not mature in time for the early market. This argument is a good one provided the plants die from natural causes and not from disease.

Weather conditions determine the first movement of the crop, but marketing usually takes place in this locality from May 6th to June 25th. The Planet Junior digger hauled by two mules is in almost universal use in the harvesting season. The pickers, consisting mostly of women and children, put the tubers into barrels. The full barrels are covered with dead potato tops until they are hauled to the grading shed. Some of the potatoes in the county are hand graded in the field as to primes, while the seconds are passed over the sizer later on. Practically no potatoes not sized over the Boggs grader are shipped by the members of the South Carolina Produce Association.

The produce association mentioned above is a cooperative marketing organization of vegetable growers of the South Carolina coast and it controls a rather large percentage of the local potato crop. This organization, beginning in a small way in 1915, now has over 500 shipping members in ten coastal counties of the state. Their popular "Palmetto Brand" is a favorite on the market during the months of May and June.

The practices of the potato growers of Charleston County may be summaizerd as follows:

(1) Seed pieces 1¼ to 1¾ ounces in weight, are spaced 11 to 12 inches apart in 3 foot rows. It is the generally accepted theory that the larger the seed piece the larger the yield and the longer the seed piece remains on the stem the better the yield.

(2) Constant cultivation is given the crop even before it is above ground.

(3) Intelligent use of a proven fertilizer formula, and the use of enough of this fertilizer to more than meet the needs of the crop, is provided.

(4) Thorough spraying or dusting is practiced.

(5) Rapid digging is the rule and the potatoes are kept cool by shading as soon as possible after digging.

(6) The crop is marketed through a cooperative organization of recognized merit.

Services, Functions, and Viewpoints of a Terminal Potato Commsission Merchant

By E. P. MILLER, Albert Miller and Company, Chicago, Ill.

(Editor's Note—The following articie is a question and answer exchange between E. A. Stokdyk, Manhattan, Kansas, and Mr. E. P. Miller.)

1. How many consumers buy carloads direct from producers? (That is, hotels, institutions, etc.)

Very few potatoes are sold direct to the consumer, even the hotels buy from jobbers, most of them haven't storage facilities, most of them want some special sorting on the stuff that they buy and the people who sell them generally extend credit for 30 days or more.

2. How many consumers can use a carload at a time?

It is impossible to say and the above partly answers this.

3. What services does the commission merchant perform?

Very few potatoes are now handled on commission. The commission merchant acts as a distributor, in some markets selling in small lots and others in carlots. We handle quite a few potatoes on commission, sometimes selling them in Chicago and when we know of a shipper and he appreciates that class of service, we sell them when conditions warrant to our outside trade.

4. Does he locate areas that are undersupplied and put the areas that are oversupplied in touch with them?

Depends entirely on its facilities. This question is partly covered in the above question.

5. Can a commission merchant buy carloads that are consigned to him?

Commission merchant has no right to buy without the shipper's knowledge any potatoes or goods consigned to him. Some do this, no doubt.

6. In your opinion, do consigned cars tend to weaken the market?

A large volume of consigned cars to inexperienced handlers of potatoes would weaken the market but in the hands of regular potato handlers would be distributed probably as well as though they were merchandised stock.

7. Would it be better to have all cars sold f. o. b.?

From a shipper's standpoint, it would be desirous to sell cars f. o. b. When the writer was on the food administration, there were many demands of this rule being put into effect, but I felt that shipper was the one best able to take care of and protect shipment, loading it so that it would not be damaged in transit and that therefore, it should be his responsibility to deliver it at destination in good condition.

8. Do you feel that the Chicago potato market influences other potato markets?

Undoubtedly, the Chicago potato market has a very considerable influence on other potato markets. It is perhaps, watched more closely than any of the large terminal markets, because from Chicago there are more diversions to other markets than from any other one point.

9. Do you feel that Chicago attracts too many potatoes at times?

Undoubtedly, Chicago does get too many potatoes at times, which is the case right now. One of the worst features in this situation is the fact that small shippers and large ones too, will frequently sell five, ten, or twenty cars to one man who is buying them strictly on speculation and is perhaps figuring at the time he makes the purchase that if he can't make a profit on them, he will turn the drafts down. There are plenty of good reliable dealers. The trade and industry generally, would be very much benefited if shippers would refuse to sell to any but responsible persons, and if then in making sales, they had a definite understanding as to just what the terms of sale were. Very often when the market is dull, the shipper will sell to someone whom he knows he is likely to have trouble with, but he hopes in this instance he may get by. A lot of rejected cars on the Chicago market or any other market does more to demoralize it than anything else. Reductions are made and the market situation is badly weakened.

10. Do you think the distribution of carload shipments can be better managed to avoid market gluts and famines?

My answer to the above question covers this. There is no doubt but what many market gluts would be avoided if shippers were more careful as to whom they sold.

11. How could this be done?

This is answered in the above question.

12. In your opinion, would commission merchants join a

clearing house and inform the clearing house of their activities so as to avoid overloading a particular market?

We will again refer to commission merchants. Even if they were handling a large volume of the business, I do not believe that a clearing house would be of any benefit. A well posted aggressive concern would not be willing to give their competitors the advantage of the knowledge that they secure at an expense to themselves.

It is just a question of the survival of the fittest, thus preventative of overloading markets is the privilege of reconsigning cars, which is now granted by the railroad. This enables a shipper if cars are rejected at a certain point to forward them and sell them at some other market. There has been an attempt to have this privilege withdrawn. Certain dealers in the west have been of the opinion that if there were no diversion privileges there would not be any congested markets. This, however, I am sure would not work out. It would result in some markets being overloaded and some markets being bare of potatoes.

I have often felt that there would be a distinct advantage in a Mercantile Exchange whereby futures could be traded in. Thus, a man could sell potatoes that he had in his warehouse. The great difficulty is, the fact that it is very difficult to designate by a grade the value of a car of potatoes. For instances, there are many cars that would technically grade No. 2, because perhaps of the larger percentage of smaller potatoes permitted under that grade, but would yet sell at a higher price because of the color, firmness of texture, general appearance, than a car that would technically grade No. 1 and if it were not for this apparently unsurmountable difficulty, we should have long ago attempted to organize some such methods of sales in handling of potatoes.

To illustrate further, ten cars of potatoes that are graded No. 1 and properly so graded by the Bureau Market Inspection, might easily sell at ten different prices.

Some markets are partial to a round variety, a few of them to a long variety. Some will not take red stock at any price, some prefer it. Some want potatoes that run uniformly large, some want them only medium size and even on any market there are certain dealers who have a trade for certain class of potatoes. Some dealers here in Chicago have a trade that demands a medium size potato, while they have other trades that want potatoes that run large in size. Certain classes of trade are willing to take potatoes grown in dark soil, while others do not want them. The potato shipper, by which I mean, the man who buys potatoes from a farmer and sells them again distributing his sales over a large territory, must know the likes and dislikes of not only the various markets in which he sells but of the customers to whom he sells.

Crop and Market News

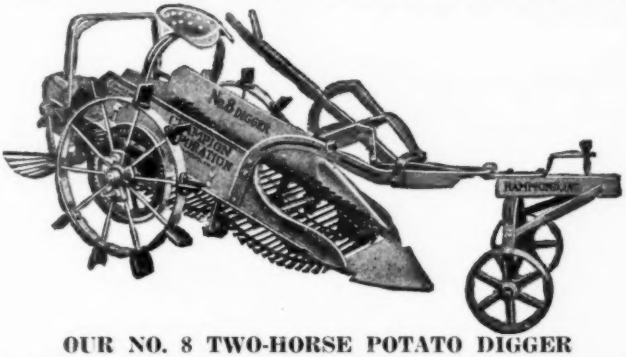
(Contribution from the Bureau of Agricultural Economics)

Potatoes in Late Summer

Prices of potatoes were about twice as high in midsummer last season, as now, yet the difference in total shipments of new potatoes was only three or four per cent at the end of June. The figures, so far as they go, suggest a very delicate balance between supply and price, but the shipment figures do not tell the whole story.

In the first place, part of the blame for the May-June slump must be shared by the old crop with its persistent spring output over the whole northern potato belt from Maine to Idaho. June shipments of old potatoes were about three times those of June, 1927. The June excess of 3,000 cars of old stock was as great as the June excess shipments of new potatoes. A let-up in the old crop movement in early spring would have given the new crop a chance to get the benefit of a late season and adjust itself to the somewhat increased production. Usually a drought somewhere in the northern states has reduced the

O. K. CHAMPION POTATO DIGGER



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May or June output. This year the indicated yield has been larger than expected in all eastern sections except perhaps the Norfolk region of Virginia, and larger also in most parts of the west.

Possibly there will be some slackening in market pressure in July and August owing to moderate yield expected in Oklahoma, Arkansas and a few other south central sections, but the expected output of 10,000 to 15,000 carloads from the eastern shore, followed by New Jersey, the Kaw Valley, and other important sections, assures plenty of late summer potatoes. The midseason shipping sections, at last reports, averaged about 10 days later this season. Lately the warm weather has had a tendency to hurry the pace of the season a little.

As to yield, most potato sections have shown a disposition to exceed last season's fairly liberal carload output. Most of the list from Florida to Texas, and north to Maryland gave evidence of sizable crops. Low prices themselves have tended to relieve the market pressure a little at times because some producers put off digging in the hope of market recovery. July and August mark the beginning of important northern shipping sections. They seem likely to have good crops, too, although a few weeks of drought might change the prospect greatly. So far, the main difficulty was not from drought but from too much rain although lack of rainfall was reported in a few sections, particularly in northern Maine.

Potatoes this season have been mostly of good quality. For one reason the price made it unprofitable to ship No. 2's or ungraded stock. It was reported that growers in the midseason districts are making but little effort to do anything with No. 2 potatoes. Last year the No. 2's were bringing as much in northern markets as the No. 1's this year. Yields seem to be generally good, so far as reported. Producers on the Eastern Shore appear to have crops ranging from 50 to 85 barrels per acre with most fields averaging around 60 barrels.

Even in early July, a few carloads of old potatoes were still arriving at some of the city markets although prices were only 50 to 75 cents per 100 pounds. The last week of June, 124 carloads of old stock were shipped. Of course the season is practically over at this time and the total carlot output is close to 270,000 cars compared with about 237,000 last season. Imports were under 4,000 cars compared with considerably over 6,000 last season.

Prices of new potatoes in the early part of July ranged from $1.50 to $2.65 per barrel for Eastern Shore stock, comprising the bulk of the receipts, while sacked Triumphs from the central south brought $1.25 to $1.50 per 100 pounds in midwestern markets. A few cars of Triumphs sold considerably below $1 per 100 pounds.

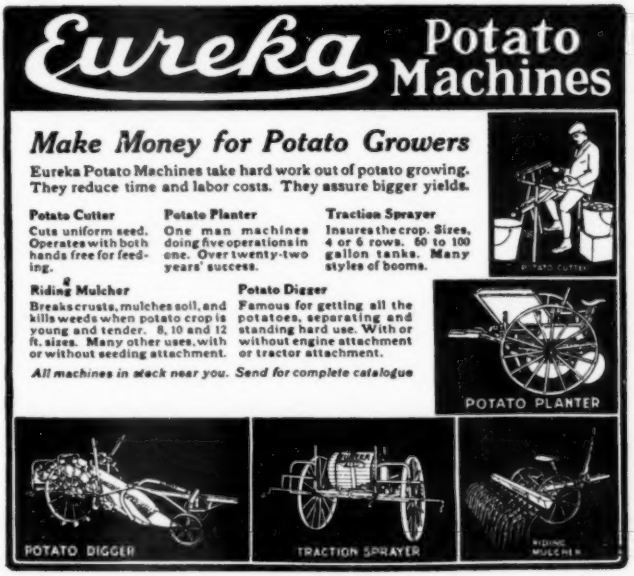
Notes

KANSAS

The Kaw Valley potato tour which was held June 13-15 witnessed the best potato prospects that the Kaw Valley has had for some years. Aside from a few fields where the stand is poor as a result of the early frost, the valley as a whole has an exccellent stand and the plants are very vigorous. The tubers are well set and weather conditions have been ideal in the past two weeks. Most of the men on the tour estimated a larger crop than a year ago. This is the reasonable expectation in view of the fact that acreage is considerably heavier than a year ago.

The Kaw Valley will have excellent quality. The first shipments will probably begin around July 1. Price prospects are not very encouraging. However, there may be a ray of hope in the situation in that proper grading and inspection will keep a lot of unsuitable cars from going to market. The situation as it lies at the present would tend to favor a late market rather than an early market.

—E. A. STOKDYK.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COLORADO

Data compiled June 20 by the Denver and Rio Grande Western Railroad Company.

The following data has been compiled from what we consider reliable sources. We present this information for the benefit of potato growers and shippers in our trade territory. As far as possible to do so we give the commercial acreage of potatoes planted rather than the total acreage. The acreage here named is what we believe will reach car lot movement.

On the Line of the D. & R. G. W. R. R.

Colorado-Utah Commercial Districts	Acreage Planted		Condition
	1927	1928	
1. San Louis Valley	31,000	29,450	Good
2. Eagle Valley	1,750	1,700	Good
3. Carbondale-Aspen	4,000	3,600	Good
4. Grand Valley (Newcastle to Mack)	3,150	2,700	Fair to Good
5. Montrose-Olathe-Delta	8,700	6,500	Good
6. Utah and Salt Lake Valleys	2,100	6,600	Fair to Good
7. Other important Colorado Districts, Northern Col.	18,500	19,000	Good

The Fruita-Loma-Mack district in the lower part of Grand Valley is the one commercial district growing early potatoes in Colorado. Some field troubles have developed but a fairly good crop is anticipated. The season is late and movement will not start until early in July.

The Montrose-Olathe-Delta district has a mid-season potato —Peoples Russet—which usually begins to move to market early in August.

The Utah and Salt Lake Valleys grow both early and mid-season potatoes. A reasonably good crop is anticipated in these valleys from Odgen to Proyo.

—W. H. OLIN and G. S. KELCH, Denver, Colo.

NEBRASKA

Western Nebraska Seed Potato Tour, August 13-17.

The tour will feature: Certified seed potato production, experimental plantings, tuber index and tuber unit seed plots, production on dry-land and under irrigation.

The tour will be conducted under the auspices of the Nebraska College of Agriculture and the Nebraska Certified Potato Growers.

—NEBRASKA CERTIFIED POTATO GROWERS, Alliance, Neb.

MISSOURI

Missouri Holds 1928 Annual Potato Tour

The 1928 Annual Missouri Potato Tour held in the Orrick district June 16th was very successful both from the point of number of growers in attendance and the interest shown.

The result demonstrations emphasized the value of such recommended practices as certified northern grown seed, seed treatment, and fertilizers. Considerable interest was shown in the different potato diseases, due to the fact that some fields had as high as 10% black leg. Black leg was especially bad in the fields where uncertified northern grown seed was used.

The fertilizer demonstrations were conducted with acid phosphate and a complete fertilizer, which were used alone and in combination with such green manures as sweet clover and vetch. Considerable interest was manifested in the study of vetch, sown after potatoes were harvested and plowed under late in the fall.

At present the general outlook for potatoes in the Orrick District is favorable. Estimated yields on some of the fields will be from 250 to 275 bushels per acre.

—J. T. QUINN.

CONNECTICUT

The season is about two weeks later than normal. The mean temperatures were below the forty year average in both April and May and the former month came very close to setting a record as only two other Aprils since 1888 have been as cold. Consequently potatoes are backward at this writing (June 19) and many fields of Green Mountains are just coming up. Early planted Cobblers are setting tubers. Reports indicate an increase in the 1928 acreage of potatoes planted in Connecticut.

—B. A. BROWN.

COLORADO

The conditions in our section—Carbondale—Aspen are the best now they have been for many years. We raise Russet Burbanks and Peachblows and a few growers are doing very good work in raising certified seed by careful selection and planting their seed plots from five to eight weeks later than their market fields so that they are immature or unripe when the vines are killed by frost.

—LOU D. SWEET.

MICHIGAN

The Michigan State Potato Tour, August 6 to 11 will give growers and visitors an excellent opportunity to inspect certi-

fied and table stock fields throughout western Michigan's potato belt. Starting at Grand Rapids the tour will cover the Greenville, Cadillac, Gaylord, Petoskey, Traverse City, Hart and Kalamazoo districts.

—H. C. MOORE.

NEW YORK

Southern and western New York has had very heavy June rainfall. Buffalo 9.36 inches, heaviest for any month on record, excepting July, 1885. Towanda, Pa. had 8.46 inches. Binghamton, N. Y. over 9 inches. Acreage will be reduced to some extent, and much will be so late that an early frost or bad blight attack would prevent much yield on the late planted fields. Most fields are weedy for lack of care. The favorable factors are the cool season to date (July 3) and the abundant water supply for the crop.

—DANIEL DEAN.

WISCONSIN

Wisconsin Potato Tour (August 13 to 18)

The tour will start at the Spooner Branch Station and will proceed through the Rice Lake, Phillips, Rhinelander and Antigo districts. Inspections will be made of certified Triumphs, Irish Cobbler and Green Mountain fields. Special field programs and entertainment features are being arranged.

—J. G. MILWARD.

GREAT BRITAIN

That the desirability of planting pure stocks of potatoes is being more generally realized is evidenced by the fact that no fewer than 60,000 acres of potatoes inspected in Great Britain in 1927 qualified for purity certificates, compared with 14,000 acres in 1918.

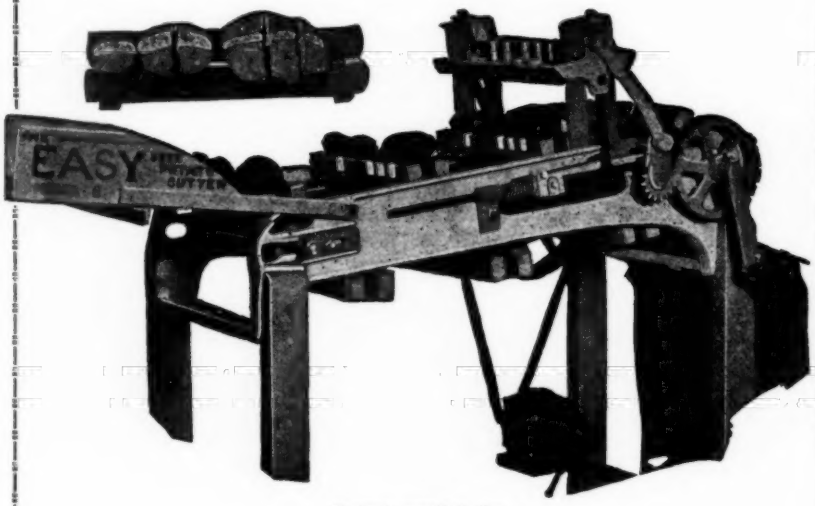
—NORTH BRITISH AGRICULTURIST, June 14th, 1928.

WISCONSIN POTATO SHOW PLANS NEW COMPETITIVE CLASSIFICATION

According to announcements made from headquarters of the Wisconsin Potato Growers Assoc. at Madison, plans are now completed for publication of a revised premium list for the State Potato Show to be held at Rice Lake, Wisconsin, Oct. 22-26, 1928.

The most important change to be made this year will be a

The New Simplified E-Z-Way Seed Potato Cutter



Patent applied for

This cut shows our New E-Z-Way potato cutter, also a sample of the 2-4 and 6 piece cut. It will also make an 8 piece cut. Notice the exact uniformness and exactness of the cuts. No hand cutting can do such uniform cutting. It is not necessary to grade the potatoes according to size, the carrier cups carry the potatoes forward to the cutting head, and the potatoes are cut into the desired number of cuts.

The simplicity of the cutter is apparent to anyone at a glance, and a 14 year old boy can operate it, and two boys can keep more than 2 planters going. Can be operated by crank or ⅛ H. P. Motor.

To insure good healthy stands it is necessary that the seed is fresh cut, full of sap and vitality, and also uniformly cut, so that the planter can do accurate work. This alone insures perfect stands of vigorous plants.

Every year in some section, just as planting begins, it commences to rain, planting is delayed, and in the meantime the seed that has been cut ahead by hand, is drying out, fermenting and losing its vitality, resulting in devitalized stands of spindling plants that never grow strong.

Chas. H. Jewell of Rhinelander, Wis., states that he has grown potatoes for the last eighteen years, and the last eight years nothing but seed for the Long Island, N. Y. market. And that since using our cutters he has had better stands than ever before, owing to the fresh uniform cut seed. Also one cutter will keep two planters going and a 70 acre field will pay for the machine.

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Kentville, N. S.

plan of state awards to be based on field records and actual producing conditions.

The association will enter Wisconsin Potato farms in competition. The following classifications have been submitted for entry. A judging committee will make awards based upon records obtained under these classifications.

(1) Soil handling operations. Results with fertilizers.
(2) Disease and insect control.
(3) Seed potato certification and improvement.
(4) Yield type and quality standards.
(5) Boys and Girls Potato Club contests.

The association also intends under this plan to make a certain number of awards to Wisconsin communities based on progress made in 1928 along the line of organized community potato work.

Appropriate trophies and prizes will be provided for these state contests.

The management of the Wisconsin Potato Show, however, wishes to emphasize that the old line of competitive classification will not be abandoned. The association will continue the regular competitive classification commonly designated, Standard Variety Class, County Booth Competition, Potato Club Classes for Boys and Girls.

The Wisconsin association believes that not enough attention has been given to awards based on actual producing conditions. Certain growers in the state, for example, are making conspicuous records relating to such phases as seed potato improvement—seed potato inspection—tuber index work—disease and insect control—successful handling of fertilizer—soil improvement and soil handling operations—improved yields, type and quality.

The various state departments assemble each year's records along these lines. The state association will receive the cooperation of these departments in making awards to growers.

Potato improvement work is quite conspicuously organized in Wisconsin on a community basis. Certain groups of growers are making progress as a community along certain specialized lines.

The above plan on re-classification also contemplates the making of awards to certain outstanding communities who have made conspicuous progress in an organized way during 1928.

At the close of the State Potato Show certain outstanding records obtained in these contests will be published by the State Association.

—J. G. MILWARD, Sec., Madison.

Review of Recent Literature

Rosa, J. T. Relation of Tuber Maturity and of Storage Factors to Potato Dormancy and Effects of Chemical Treatments on Dormant Potato Tubers. Hilgardia 3:99-142. 1928. No. 4.

Two varieties, White Rose and Idaho Rural were used in most of the experiments reported in this paper. Irish Cobblers were included in a few experiments. Potatoes were dug at different stages of maturity and placed in storage for different periods. Each sample was divided, one part being stored at 4°C, the other at 23°C except for one year, when cellar storage alone was employed. All samples for a given year were planted on the same date and the time of emergence of the plants above ground noted. This period decreased with the maturity of the potatoes when dug. No consistent differences in results were apparent between the halves of the samples stored at 4° and at 23°C. Rose concludes from this experiment that the more nearly mature potatoes are when harvested, the shorter is the dormant period.

In the opinion of the reviewer much confusion would be avoided by a general recognition of the difference between the true rest period and the period of dormancy in potatoes. The latter includes the true rest period but it may be of much longer duration if conditions are unfavorable for growth. Rosa's use of the term dormancy apparently refers to the true rest period in most cases.

Rosa's second experiment was devised to test the duration of the Dormant period in both mature and immature potatoes. The potatoes were stored at 20° to 23°C and samples were planted in the greenhouse at different intervals from the date of harvest. Fall crop potatoes harvested immature because of frost required a considerably longer time to emerge than mature potatoes of the same variety.

In determining the duration of the rest period it is difficult to decide the event from which to date the rest period. If the date of harvest is chosen then this date must coincide with some rather definite stage in the life history of the plant. Potatoes will pass through their entire rest period in the ground. Are the normal ripening processes in immature potatoes concurrent with the after ripening processes character-

istic of mature potatoes or does the true rest period of immature potatoes begin only after they have fully matured? Of course, for practical purposes it is immaterial how this question is answered as we are concerned primarily with the time required to produce a crop from the seed of a previous crop.

The relation of storage temperature to dormancy was studied. Potatoes from nearly mature plants were dug June 20 and July 1 and placed in cold storage at 1°C and in a cellar at 23°C. The storage period was 36 days for the June 20 and 26 days for the July 1 samples. The potatoes were cut and planted July 26. From the results of this and other similar experiments Rosa concludes that previous claims as to the hastening of sprouting by cold storage are not substantiated. In a previous statment on page 105, White Rose tubers are said to be approaching the end of their dormant period at 28 days and mature Idaho Rurals at 39 days, after harvest. If this is true then both the White Rose and Idaho Rural potatoes, even at the 23°C storage were nearly through the rest period before they were planted.

The results of the histological studies are of special interest. The condition of the bud primordia in tubers at different stages of maturity and at different times in the dormant period was investigated. Rose concludes from these studies that at temperatures favorable for growth the meristematic region is probably never entirely inactive. There is just one figure in the text which is supposed to show further development of the young sprout during the rest period and this section was made 32 days after harvest, when the White Rose potato would be emerging from the rest period according to an earlier statement in the text.

The paper is concluded by results of experiments on the much disputed effect of cutting potatoes several days before planting and allowing the cut surface to become suberized.

The second paper records experiments on the use of chemical stimulants to hasten sprouting of dormant tubers. The ethylene chlorhydrin treatment proposed by Denny proved to be very effective for White Rose and Idaho Rural varieties. The effectiveness of other chemicals was also confirmed.

From a practical viewpoint Rosa advocates a combination of storage methods known to hasten sprouting with the use of chemical stimulants upon small tubers.

—C. O. APPLEMAN.

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	AMMONIA	AVAILABLE PHOSPHORIC ACID	TOTAL PLANT-FOOD
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AMERICAN POTATO JOURNAL

PUBLISHED BY

THE POTATO ASSOCIATION OF AMERICA

EAST LANSING, MICHIGAN

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The Eastern Shore Farmers Association

F. B. BOMBERGER, Executive Director Del-Mar-Va Eastern Shore Association, Salisbury, Md.

In discussing the objectives and achievements of the Eastern Shore Farmers' Association, the fact must be emphasized that the principle underlying the plan of operation of the Eastern Shore Farmers' Association, or of any other of the so-called "Clearing House" plans of marketing, is of very much more significance than is the detailed plan of operation or the specific achievements of such an organization. The question that is forcing itself for solution upon economists and marketing officials is: "Have we reached a new stage in the evolution of marketing organization as it relates to the distribution of farm products?" In the widespread eagerness of producers, dealers, bankers and others directly interested in the marketing of such products to try out some one of the many types of Clearing House organization, there is abundant evidence that the answer to the inquiry must be, "yes."

Until recently most observers of the evolution of marketing held the idea that the normal process in cooperation was for the cooperative organization to widen its membership and increase its business until it should attain a virtual monopoly in its line or in its territory. In actual practice it has been observed that often two or more cooperatives appear in the same territory and compete with each other and with independent dealers for the privilege of selling the growers' products. The

new stage of the evolution suggested above is indicated by efforts being made to devise plans to limit and regulate such competition in such a way that unnecessary price cutting may be eliminated.

The so-called "Clearing House" plans of marketing have been designed to meet such situations. The multiplication of dealers in the farmers products, whether they be cooperative associations or independents, has set up such a fierce competition among them that, in times when markets are dull, prices of the farmers' products are ruthlessly slaughtered because of the desire of and even necessity for the several dealers or cooperatives to handle their respective quotas of business. Left to itself, such a situation goes from bad to worse.

Apparently the only method of bringing order out of chaos is to superimpose upon the struggling competing selling organizations some sort of regulatory body. To fall within the limitations of the Capper-Volstead Act and the several state cooperative association laws, it is necessary that such an organization be composed of producers. As such plans provide that the products of all or of a very large percentage of all the growers shall be brought under the control of the farmers association through the medium of the individual selling agencies, the term "Clearing House" has been applied to organizations of such type. The Eastern Shore Farmers Association is a farmers' cooperative organization of that kind. It was designed to do two principal things; viz., to regulate the flow of potatoes to market and to restrict and restrain price cutting among dealers and exchanges.

In creating the historical background necessary for an understanding of marketing conditions on the Eastern Shore of Maryland and Virginia which made necessary the establishment of the "clearing house" organization, it is desirable to point out that the organization of the Eastern Shore of Virginia Produce Exchange, a farmers' cooperative, in 1900 had been followed by the formation of the "Peninsula Produce Exchange," another cooperative in 1904; while in the years that followed, independent dealers multiplied in the field until in 1926 there were more than a dozen of them in addition to the two Exchanges. It should be noted that of the total tonnage of poatoes marketed, the Eastern Shore of Virginia Produce Exchange handled, on an average, from 60 to 65%, the Peninsula

Produce Exchange 10% to 15%, while the independents divided the remaining 20% to 25% of the tonnage among themselves.

As the season progressed and the movement of potatoes rapidly increased, a price cutting competition among dealers resulted, with the scaling of prices for the farmers' product often out of all regard for the relation of supply and demand. It thus happened that, in 1926, with a normal crop, with no surplus supply endangering the market, the selling competition among dealers reduced the average prices to a point where many growers received less than the cost of production, while some dealers were heavy losers. The banks were full of frozen credits, extended to growers and dealers.

As a result of such conditions and at the urgent demand of the banks, at the opening of 1927, there was organized the Eastern Shore Farmers' Association, a cooperative organization of potato growers of the two Eastern Shore Counties of Virginia. Growers signed contracts binding themselves to sell their potatoes only through dealers or exchanges affiliated with the Farmers' Association. Affiliation of dealers and Exchanges was effected by execution of a bond, obliging the respective dealers and Exchanges to market the potatoes of the members of the Farmers' Association in accordance with rules established by the Association. Chief among such rules was one which prohibited the dealers or Exchanges from quoting, offering to sell, or selling potatoes at prices lower than those named by the Quotation Committee of the Farmers' Association.

The Quotation Committee consisted of three members, elected by the Board of Managers of the Farmers' Association, who were elected by the members of the several magisterial districts of the two counties. The Quotation Committee was given broad powers relating to the marketing of the potato crops and exercised the special function of quoting from time to time, prices at which potatoes were to be offered, such prices varying in accordance with market conditions as interpreted by the Quotation Committee.

The foregoing are the principal features of the organization under which the marketing of the white and sweet potato crops of 1927 was undertaken. The operation of the plan was handicapped by the fact that only approximately 30% of the potato acreage in the Virginia Counties was signed up and none in Somerset and Worcester Counties in Maryland, which later furnished a supply of potatoes that greatly complicated the marketing situation. A further handicap was the failure to attain a 100% affiliation of dealers and exchanges and the fact that none of the farmers' who signed the association agreement was bound under any penalty to market his potatoes through the affiliated dealers. Another element which increased the

pressure upon the newly organized marketing agency was the totally unexpected proportions of the 1927 potato crop, which exceeded the normal crop of 1926 by 53%.

Despite these handicaps, the largest crop ever grown on the Peninsula was marketed under the direction of the Quotation Committee with an average price running through the season of only about 15 cents per barrel less than the average of 1926. The total gross returns from the 1927 crop of 22,000 cars was approximately $4,500,000 greater than were the gross receipts from the 1926 crop of 14,000 cars. As a bumper crop has heretofore spelled disaster, it is evident that the influence of the Quotation Committee must have been very potent.

The Board of Managers of the Farmers' Association have systematically improved their plan of organization to insure its effective operation in 1928. Farmers of the potato growing counties of Maryland have been brought within the scope of the Association; definite contracts to sell their potatoes through affiliated dealers, with liquidated damages for violation, have been signed by farmers representing more than 85% of the potato acreage. The powers of the Quotation Committee over regulating loading and distribution of the potatoes have been greatly extended.

All things considered the Association should be in stronger position to meet the difficulties involved in marketing the Eastern Shore white potato crop than they held last year. Whatever the outcome, the Association will well repay observation and study.

The Hastings Potato Growers' Association

EDWIN B. REID, Federal Land and Interstate Credit Banks, Washington, D. C.

The potato growers, numbering 193, who compose the Hastings Potato Growers' Association in Northeast Florida, have efficient methods of growing, financing and marketing the potato crop grown on some 7,700 acres. They are probably more efficient in financing their operations and in getting their crop on the market at a minimum cost and with a maximum return than they are in producing the potatoes. Their average yield runs between 35 and 40 barrels of eleven pecks and they figure,

that is, most of them, that they must get $4.25 a barrel for them in order to break even. However, there are some growers who make money at that figure, for they estimate their cost of production at anywhere from $3.10 to $3.40.

How much do they get for their tubers? Well, these cost of production figures appear rather small some years. Possibly that accounts for the lack of initiative in diversifying. Early potatoes from this famous district some years have brought as high as $16.00 per barrel. Then again they sell for $3.50 or less. That's the way with agriculture. Even the very efficiently managed cooperative marketing association cannot do the impossible li e preventing frosts or a late crop. Ordinarily, however, frost does very little killing damage. It delays the crop until the potatoes compete with potatoes grown further north, and that, of course, makes it difficult to obtain fancy prices for them. The average price for the last five years will run somewhere between $5.50 and $5.75 and the yield has varied, on the average, from about 27 to 47 barrels. With that wide fluctuation in both yield and price potato growing in the Hastings district is just about as hazardous as in any other early producing area. However, the district has prospered through the years. Records of $13,000 worth of potatoes being sold from 40 acres stimulates the imagination and starts the farmers on a larger acreage. However, when the very next year it costs the farmer $1,800 more to grow the crop on that land than he got for it, the acreage the following year is likely to be contracted.

There are farmers in this district who make money every year and, of course, in the good years of fair yields and high prices they "make a killing." Some of these growers are growing more cover crops like peas, plowing more deeply, using machinery that steps up the amount accomplished per man on the farm. A few have discarded the two-mile-an-hour mule for the five-mile-an-hour tractor; they cultivate six rows instead of three and it is predicted they will be digging two rows of potatoes at once, before long.

It is surprising to one who has not followed the cost of production of early potatoes in the southeast to learn the cost of production of an acre of these tubers. In fact, it is such a factor that its financing is a serious matter. However, the grow-

ers about Hastings have solved it in a manner which is worth adopting by many growers and their organizations elsewhere.

When a farmer makes application to join the Hasting Potato Growers' Association his assets and liabilities (his credit statement) are weighed very carefully for the association not only markets all of the marketable potatoes produced by its members but it finances many of their operations as well. It knows that the prospective member, if he is accepted, will be entitled to a line of credit of $135 to $175 per acre of potatoes. For instance, if he is the average grower and has 40 acres he is likely to wish to borrow $125 an acre or $5,000. The success of the methods of financing these growers vouches for the thoroughness with which their financial obligations and assets are investigated before they become members.

From a portion of the reserve set up through the last several years by the Association, there has been formed an Agricultural Credit Corporation with a capital paid in of $75,000.00, and which will be increased before another season to $100,000. This corporation takes the members' notes for the period for which it is necessary for them to borrow and rediscounts them with the Federal Intermediate Credit Bank at Columbia, South Carolina. It is permitted thus to borrow six to eight times the amount of the paid in capital. It is one of about 60 agricultural credit corporations rediscounting farmers' notes given for agricultural purposes in the area served by the bank at Columbia, the Carolinas, Georgia and Florida. However, very few of the corporations are set up by cooperative marketing organizations, possibly because they have not had the reserves to do so.

These Hastings farmers borrow to buy seed, fertilizer, spray material, containers, and in addition about $20 an acre which is used for labor in growing the crop. In addition they borrow in some instances to harvest the crop. This means they can pay "cash on the barrel head" and the saving made thereby far exceeds the 6% interest which they pay for the money. Not only do they save by paying cash, but bulk purchases by the association still further reduces prices. For instance, when a check for $69,000 for fertilizer represents a single purchase, there can be no doubt of the saving to members. They are now getting 5-7-5 to 6-8-5 fertilizer, f. o. b. Jacksonville and Savannah at $31.80 to $37.00 per ton of 2,000 pounds.

Their seed, selected, state-certified stock from Maine, costs them this year $4.90 per 11 peck barrel. And that isn't half of the story. The association hires a former county agricultural agent who has had experience both in Florida and in Maine to select the seed. He stays in Maine all the spring and summer, watches the fields, sees the rows rogued and in other words

"knows his seed potatoes" before he makes his selections from which the purchases are made. Seed is one of the things these Hastings growers are particular about and always have been. They have sent hundreds of thousands of dollars into Maine and to date they are much pleased with the results. It's what produces the Superior Brand of Early Potatoes (Spaulding Rose No. 4) which is sold only in two grades, and this year the growers' association will be safeguarded with Federal point-of-origin inspection.

The manager of the cooperative association is H. L. Robinson. During the shipping season, which this year extended from about April 16 to June 1, he is constantly in touch with the markets to the north through a leased telegraph line running directly to Jacksonville.

By being thus informed, Mr. Robinson is able to determine for the association just what is the situation in a given market and to quote the price accordingly. In other words, he tries, and usually succeeds, to name his price rather than let the market operators—the jobbers, wholesalers and retailers—do it. He has popularized the Superior brand until there is no doubt in the minds of the northern purchasers as to what kind of "superior" they will get when they purchase from this cooperative.

A straight charge of 30c per barrel is made for handling the potatoes of the members. Out of this, eight cents goes into a reserve fund (three cents for the building and five cents for the general reserve) and 22 cents into operating. Thus the growers, who pay $15 membership fee and market their potatoes through the daily pool, are not only marketing their potatoes to advantage but they are gradually accrueing a larger and larger equity in the $40,000 building which the association occupies. In fact, at the present rate, it will be paid for within the next five years. After that the plan is to repay in the order of their contributions through the reserve, the funds they have advanced for the purchase of the building.

Thus the Hastings Potato Growers' Association is more than a loose-jointed cooperative with no capital and no continuity. It is a well managed institution rendering a number of services which are outside the realm of marketing. Few potato marketing organizations, for instance, could boast of a million dollar line of credit such as this one. And that credit is granted because of the collateral available and the record of efficient management. There is nothing patented or secret about this set-up. It is visited annually by many people who would try to duplicate its operation, applied to their particular lines of endeavor, and they are always welcomed.

Profitable Potato Dusting

H. W. Dye, The Niagara Sprayer Company, Middleport, N. Y.

The protection of growing potato plants against disease and insect pests by the method known as dusting is of vital interest today. Since this interest exists, some simple facts on the subject of potato dusting should interest the reader of this journal.

The Development of Dusting

Potato plants, of course, require a copper fungicide. Early attempts to produce an effective material of this type were unsuccessful because they resulted in the so-called bordeaux dusts. In their manufacture bordeaux mixture was dried down and the residue ground and mixed with hydrated lime. Although high in copper content these dusts were relatively ineffective because of their method of manufacture. In making bordeaux mixture when a copper and a lime particle are brought together in the presence of moisture a colloidal membrane is formed. This membrane is destroyed in the drying process referred to above and does not form again in the presence of moisture. Thus bordeaux dusts are unlike liquid bordeaux and the reason for their failure to equal it in fungicidal value is clearly evident.

By 1919 a copper lime dust had been developed which acted similarly to bordeaux mixture. Thus, since that time data has been accumulating in the hands of experimental workers and practical growers on the effectiveness of copper lime dust on potatoes. Likewise it was soon found that Calcium Arsenate could be combined with this for the control of the potato beetle, and that aphis could be controlled by a separate application of nicotine dust where necessary. Likewise, machines suitable for applying these have been developed.

Present Day Dusts the Same as Spray

The generally used and accepted copper dust on the market today is of a copper lime dust type, and consists of monohydrated copper sulphate (crystals from which moisture has been removed) and hydrated lime. This is inactive when stored as a mixed product in suitable metal containers and unites on the plants, in the presence of dew, to make bordeaux mixture. The chemistry of this dust is essentially that of bordeaux mixture. Theoretically, stone lime makes a better bordeaux spray than does hydrated lime, but actually the latter is nearly universally used by growers on account of its convenience and very satisfactory bordeaux results. Thus, there is

no practical reason why a copper and hydrated lime dust should not be effective. While it is true there is an excess of lime in copper lime dust, yet data at present seems to show this has little or no disadvantages. Some carbonation of lime results on the plants, unless moisture is present at the exact time of application of the dust, but sufficient lime remains unchanged to neutralize the copper and combine with it to form bordeaux membranes like those in bordeaux spray. Consequently, properly made material of this type is entirely safe on potato vines. Thus, properly made copper lime dust of good quality is the equivalent of bordeaux mixture spray.

Calcium Arsenate is the accepted, economical poison for beetle control on potatoes in either dust or spray formulas. Thus copper-calcium arsenate-lime dusts are compatible for use on potatoes.

The standard nicotine sulphate used in spraying for aphis control is equally adapted for use in dust form, and for this purpose is available combined with lime and certain liberators. The full value of nicotine is not obtained when combined with copper and with an arsenical—hence, separate applications of the nicotine dust are recommended.

The Dusting Method Yields Results

Not all experimental workers agree on the effectiveness of the dusting method, yet, with few exceptions, those who have had experience with this method of recent years agree that it has merit. Actually, modern data shows that the method is efficient and profitable.

Three publications during the past six months are especially interesting and worthy of consideration. Brief mention of interesting items from these publications follows:

Potato leafhoppers, and the accompanying hopperburn they bring about, produce a greater economic loss than any other potato insect, and oftentimes the damage resulting from them in any section is greater than that resulting from blight. Messrs. Dudley and Fluke (Wisconsin Agricultural Experiment Station Research Bulletin 82) conducted spraying and dusting experiments in commercial potato fields of Wisconsin for four years, under regular farm conditions. They found that both methods yielded a satisfactory control of hopperburn, and both increased the yield and improved the grade of potatoes harvested. The yields from dusting and spraying were equal, within the limits of experimental error. The data in this publication will interest every potato grower because hopperburn prevention is a universal problem.

Mr. McKinley (Florida Agricultural Experiment Station

Bulletin 193) presents the greatest mass of potato data yet published, in connection with an economic study of potato farming in the Hastings area of Florida. A survey of 281 farms in that area shows that in every group of his classification better yields were secured where dusting was practiced. In reading this publication please bear in mind also that the data presented are for the year 1925; that in the current season (1928) the total dust consumption in that area has increased to approximately 425 tons; that the average number of applications is now three to four instead of two or three; and that with better manufacturing facilities in that area the cost of dust has been reduced $2.00 per hundred pounds.

Messrs. Dye and associates (Niagara Sprayer Company Scientific Extension Division and Research Department Bulletin 431) in 1927 secured extensive data as follows on the farms of commercial potato growers in Pennsylvania:

Demonstration	Check Bu. per Acre	Dust Bu. per Acre	Increase Bu. per Acre	Increase Per Cent
1	116	240	124	107
2	167	211	44	26
3	226	355	128	58
4	120	305	185	154
5	80	213	133	166
6	180	424	244	136
7	158	231	73	46
8	133	271	138	104

The average yield of the eight check plats in the demonstration conducted, as shown in the above table, was 147 bushels per acre. The average dust plat yielded 281 bushels per acre. Thus the average increase was 134 bushels per acre, which is an increase of 91 per cent.

Potato Dusting is On the Increase

Commercial potato dusting is rapidly becoming more general and is meeting with good success. It is easy to hear that in some distant section the growers are discarding their dusting and going back to spraying. Usually, too, there is no difficulty in hearing that some grower has had no control at all with dust. As a matter of fact these are often only idle rumors which receive far more advertising than they deserve. To be sure, some growers fail to get results with dusting, just as is the case with spraying. Yet we do not condemn the spraying of a crop, since this has been the accepted practice for years, because some grower, through negligence or improper methods, fails to produce a quality crop of potatoes, and a newer method should be entitled to equal courtesy.

The facts are that the dusting of potatoes is increasing in popularity very rapidly indeed, and is not on the wane in any

area where common sense merchandising of proper dusts and dusters is being practiced.

Dusting is Practical and Therefore Popular

Every extension and experiment station worker knows how difficult it is to get growers to purchase spraying equipment and materials, and to properly protect their crop by this method. A good deal of this reluctance is due to the fact that knapsack sprayers are not adapted for small commercial plantings and on any area, large or small, so much extra labor is involved in proper spraying that this practice is difficult with modern labor conditions, to fit into the farming schedule.

The modern crank type duster will take care of the small acreage readily and with comparative ease, whereas the horse-drawn dusters now available range in size up to the six-row type for large acreages. All these machines make possible applications with far greater ease and rapidity than is possible with ordinary spraying equipment. Dusters are not perfect to be sure, but are as efficient as could be expected in view of the time they have been in use and are constantly being improved.

The practicability of the dusting method seems to explain its popularity. Messrs. Dudley and Fluke (Wisconsin Agricultural Experiment Station Research Bulletin 82) sum this up very nicely in "Dusting appeals more strongly than spraying to many growers on account of its greater speed and popularity," and mention also on the part of growers a "Consequent willingness to repeat applications when necessary."

Some Dusting Recommendations

Use the same common sense in protecting your crop with the dusting method that you use for any other well regulated farm practice—this means getting good quality materials and applying them under as favorable conditions as possible to secure control.

The grower should purchase a standard brand of dust of the sort mentioned above, properly packaged so as to avoid deterioration before application. Metal containers are the only satisfactory packages yet obtainable, and in them dust will keep without deterioration for at least one year.

Select the dust adapted for the particular pest you are combating—whether it be copper lime dust for blight or hopperburn control, copper-arsenate dust for beetles, or nicotine dust for aphis.

Apply this in plenty of time to protect your crop against the first attacks of your pest, for early applications are often times the secret of effective control. Apply the material you select under as favorable conditions as you can obtain, and this

usually means under quiet conditions which are best obtained in early morning or late evening. It is difficult to understand why some of the otherwise best growers lose a lot of money by making their particular applications under windy and dry conditions. To be sure a grower can not expect the hired man to work all night and all day, and remain satisfied long, and neither can he afford to do this himself, but protecting the crop properly by the dusting method does not involve this. Protective applications can be made very rapidly and a few hours are sufficient to cover large acreages, and with the average grower a moderate amount of time spent in early morning or late evening or both, is entirely sufficient to afford protection to his crop. Where the acreage is large, growers will find that the hired man is usually glad to do this work at this time under cool conditions and will remain happy and contented if allowed, in return, a corresponding time off in the heat of the day.

Dusting under favorable conditions possesses many advantages and yields better results, and is readily made possible by some modification of the regular schedule, as suggested above. Certainly, if the time is not available for making dust applications then spraying is entirely impracticable because of the greater time and labor element involved.

Common sense dusting of potatoes, therefore, involves using the right material for the pest you are combating, a quality product, and applying this under as favorable conditions as you can. The only other recommendation that can be given is to keep new growth protected as the plants develop.

The application of materials to potatoes in powdered form affords an efficient, practicable and commercial method of protecting your potato crop. The increasing acceptance of this method by growers universally is a true index of its merit. Common sense protection with good materials will give satisfactory results.

Spraying Potatoes for the Control of Insect Pests in New York

P. J. CHAPMAN, Entomologist, Va. Truck Experiment Station, Formerly Assistant Extension Entomologist of New York at Cornell University

Many growers consider that the only real purpose of spraying potatoes with Bordeaux mixture is to prevent late blight. That this belief has a large following is indicated by the decrease in the amount of spraying following two or three blight

free years. Now, tests in New York, also Michigan and other states, have repeatedly shown that spraying will increase potato yields every year. This rule has held true during years when late blight was prevalent and during years when this disease was nowhere in evidence. In large measure, the explanation is that Bordeaux mixture also prevents serious injury from the potato leaf hopper and potato flea beetle.

It is a conservative estimate to place the annual reduction in yield caused by the potato leaf hopper at 15% in Michigan, Ohio and New York outside of Long Island. Unlike blight, this insect causes important damage every year in numerous localities.

Leaf hopper injury is only too familiar to many growers. But a much larger group have yet to link up the swarms of tiny whitish insects which abound in potato fields during the fall, with the curling and browning of the leaves known as "hopperburn." It is this insect which causes the leaves to turn brown at the margin, to curl, and finally to cause the vine to die prematurely.

Tests with many insecticides in many states have made clear that spraying with Bordeaux mixture is the most practicable control measure for the pest. Plants covered with this material are avoided by the hoppers for feeding or egg laying purposes. Furthermore, the younger nymphs may be killed outright by being coated with this spray or from feeding on Bordeaux covered leaves. The nymphs, or young hoppers, are wingless, light green and are found on the lower side of the leaves. The use of "contact" insecticides such as nicotine have not proved satisfactory. These materials are very expensive and even when five or six applications are made the results have been no better than in fields treated with Bordeaux mixture.

Leaf hoppers start to appear on the late potato crop when the plants are up several inches. The spray customarily applied when the plants are from 5 to 8 inches high is usually of considerable value in preventing the hoppers from laying eggs from which will arise the later broods. The number and interval between applications necessary for commercial control of this pest will vary considerably. Through Central and Western New York five and six Bordeaux sprays have given good results. Starting when the plants are 5 to 8 inches high, a grower should be guided in making later applications by weather conditions which are suitable for blight or the hoppers (leaf hopper injury is more serious during hot dry seasons); by the normal importance of leaf hoppers for the locality, and the value of the crop (table stock or seed purposes) to be protected. The addition of 2 or 3 pounds excess lime to each 50 gallons of Bordeaux mixture probably increases the efficiency of the spray against leaf hopper.

Copper lime dusts or proprietary Bordeaux dusts may be used for leaf hopper control. In general, tests indicate that spraying gives better protection against this pest than dusting but the question of which practice to follow is for each grower to decide.

Flea beetles avoid vines well covered with Bordeaux mixture. Calcium arsenate (about 4 or 5 pounds per acre) should be added to the Bordeaux when these pests are numerous. The flea beetle is very small, black, and jumps readily when disturbed; it is the insect which eats numerous small holes in the leaves.

Most growers know how to handle the Colorado potato beetle, or potato bug. It is usually a good plan to use the poison designed for this pest in combination with Bordeaux mixture for the protection it gives against diseases and the leaf hopper. Four pounds of calcium arsenate per acre is about the right dosage for potato bugs.

How Much Scab and Scurf (Rhizoctonia) May Certified Seed Potatoes Carry?

C. W. WAID, Chief, Fruit and Vegetable Standardization, State of Ohio, Department of Agriculture, Columbus

The question of the amount of scab and scurf (Rhizoctonia) which Certified Seed Potatoes should be allowed to carry is one which is being given considerable thought both by the producers and the users of Certified Seed. There is unfortunately a lack of agreement between them largely due to the difference in their point of view.

It is the purpose of this article to try and present some of the arguments on both sides of this controversy hoping that it will help to bring about a better understanding of the entire situation.

Some users of Certified Seed Potatoes seem to look for visible evidence of imperfections in the seed, and if they find such evidence, are inclined to feel that the seed is not what it should be. It probably is natural for them to take this attitude because most of us notice the things which are conspicuous more readily than those which are not so easily seen. Furthermore, many of those who have been handling Certified Seed as distributors, are dealers in table stock and they naturally look to the appearance of the tubers more than to any other evidence of quality or lack of it.

Those who have had close contact with Certified Seed growing or who have given careful thought and study to the methods used by Certified Seed growers realize that the unseen diseases may be and usually are the most serious. It is largely because of this fact that field inspection for certification has been developed.

It is impossible to detect with the eye by examining the tubers the presence of any of the following diseases which may be present in the seed: Leaf Roll, Curly Dwarf, Mosaic and some other less serious troubles. It is also difficult to detect such troubles as Black Leg, Fusarium Wilt, Spindling Tuber, Giant Hill, etc., unless a person is trained to recognize the ear marks of such diseases. On the other hand, even the untrained eye can detect with little difficulty the presence of scab and black scurf.

Another important phase of this question is that by proper seed treatment, scab and black scurf can be entirely eliminated from the seed stock, and at the same time, seed treatment has no effect on most of the invisible troubles previously mentioned. This in itself, places scab and black scurf in a much less important class than some of the other diseases.

A good many users of Certified Seed think of it as being absolutely free from any transmissible diseases and especially those which are visible. It will take some time before this class of users can be brought to realize that from a practical standpoint, it may not always be possible to grow crops absolutely free from scab and scurf.

Potato growers who have acquired the habit of treating all seed planted to control scab and scurf do not have the same fear of these troubles when present to a limited extent (within the tolerance) on the Certified Seed, as those who do not treat their seed.

It is quite possible that with the improvements which are being made in the methods of treating seed that it will become a more general practice among potato growers. When the time comes, if it ever does, that practically all potato growers treat their seed potatoes for scab and black scurf, the question of the importance of these troubles will be of less concern.

Turning to another point of view that of the seed grower, it is easy to explain that under certain conditions which may not be entirely within the growers control, a limited amount of scab and scurf may develop.

At best, the Certified Seed grower is required to pay out a considerable amount of money and to go to a great deal of trouble to produce high class Certified Seed. When it comes to sorting and grading, he is required to throw out a considerable larger percentage of tubers than would be necessary if they were to be used for table stock. This of course, means

that he will have fewer potatoes to sell when they are sold for Certified Seed than he would have if he sold them as table stock. Furthermore, the tendency in the past has been to require the seed producer particularly in the north to store his potatoes and keep them until nearly planting time. This necessitates extra handling, more or less loss of weight, and shrinkage in other forms and requires the producer to take all of the risks which naturally go with the winter storage. If the potatoes are frozen during the sotrage period, it is his loss. If Late Blight is present, the decay during the period of storage may be very heavy. All of these things put together place the Certified Seed grower in a position to be justified in asking that the user of his seed pay him what may seem to the user a liberal advance over table stock prices for the same season.

Because of the many obstacles to be overcome, expenses to be met, etc., a good many potato growers have attempted the production of Certified Seed and after giving it a trial have decided to confine their efforts to the production of table stock. It should, therefore, be apparent to all users of Certified Seed that in order to provide a sufficient supply annually to meet the increasing demands that the producers must be encouraged in their efforts in the way of substantial returns. In other words, they must receive a satisfactory return for their extra efforts or they will not continue in the seed growing business.

There is one criticism which can, I believe, be justly directed to the producers in connection with the topic under discussion. That is, when they have gone to all of the expense and trouble of producing high yielding Certified Seed and for some reason may have been unfortunate enough to have had scab or scurf develop on a portion of the tubers, they should be willing to do a careful job of grading in order that as large a percentage of the noticeably infested tubers as possible be removed before sacking for shipment or sale.

It should be evident on the part of the producer that under existing conditions, the user is going to criticise the minute he sees any considerable number of scabby potatoes among those which are Certified.

Incidentally, we might mention, although it is somewhat foreign to the topic, that another thing which the producers should learn to do is to handle the potatoes more carefully. Much of the trouble with Dry Rot development could be avoided with more careful handling at all times.

We have not covered this subject completely and hope that others will add their point of view to this discussion until the question has been answered to the satisfaction of both producers and users.

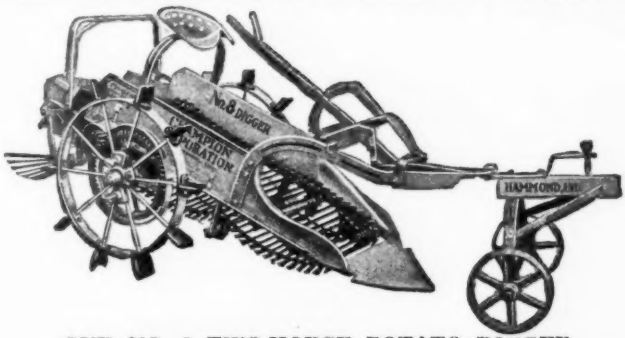
Crop and Market News

(Contribution from the Bureau of Agricultural Economics)

Potato Markets Show Improvement

Passing of peak movement of potatoes on the Eastern Shore of Virginia was followed by a decided improvement in market conditions. From low point of $1 per barrel in July, f. o. b. prices had advanced to a range of $1.75-$1.85 in early August and city jobbing sales were being made at $1.75-$2.75, with some lots a few cents higher. After a rather disheartening season, this change of the situation brought great encouragement, and growers and shippers who held some stock for the later market were rewarded. When shipments were at their height and when markets were oversupplied and prices were low, considerable quantities of potatoes were placed in sweet-potato storage houses on the Eastern Shore. One grower stored a large number of barrels under a tent, in the hope of better prices later. Carlot movement was held to a rather moderate volume during the forepart of August. Sacked stock from the

O. K. CHAMPION POTATO DIGGER



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333 Sheffield Avenue, Hammond, Indiana

Eastern Shore and New Jersey was jobbing at 90c-$1.35 per 100 pounds in New York.

The situation had been equally discouraging in the Middle West and in far western states. But, strengthening of eastern markets was having its effect farther west, and shipping-point prices in the Kaw Valley advanced slightly to 50c-60c per 100 pounds of sacked Cobblers. Growers around Topeka agreed not to dig for less than 50c. The Chicago carlot range reached 85c-$1, with indications of further advances. Prices in other cities were higher than those in Chicago. Returns to growers in southeastern Minnesota and in Colorado, Idaho and Utah were still very low, averaging close to 50c per 100 pounds. One farmer in Colorado reported an offer of 75c, but hardly felt that it would pay him to accept that price. He was inclined to hold for the future market.

Nearly all mid-season potato sections were reporting heavy yields. Fields in southern Minnesota, which at first gave indications of 125 to 150 bushels per acre, were yielding 200 bushels during late July, with a few growers getting 300 bushels per acre from some fields. Stock was well-sized and of good quality. Because of heavy yields on the Eastern Shore, the original forecast for the Virginia early crop was increased by 1,500,000 bushels to a total of 13,250,000. The combined estimate for second-early states also was raised by 1,500,000 bushels to a total of 15,000,000, compared with 14,406,000 in 1927.

Heavy Production Expected

Crop prospects continued favorable in nearly all the northern and western states, though potatoes on Long Island were blighting badly about August 1. Total acreage of potatoes in the United States is now estimated at nine per cent greater than last year, and production may amount to 444,000,000 bushels, according to July reports. That would be 37,000,000 more than in 1927 and only 9,000,000 bushels less than the highest previous record established in 1922. The North Atlantic and North Central States have a greater indicated gain than any other part of the country, while western sections together may have 3,750,000 bushels less than last year, but still 16,000,000 more than their five-year average. At least five states, Maine, Minnesota, Michigan, New York and Wisconsin, expect more than 32,000,000 bushels each. The net cost of producing potatoes last year ranged from 49c to 80c per bushel.

Total shipments the present season are running ahead of last season's corresponding record. By the beginning of August, more than 60,000 cars had been moved, in addition to heavy haulings by truck. North Carolina shipped 8,700 cars, compared with 7,540 last year. Virginia's total was already 3,600

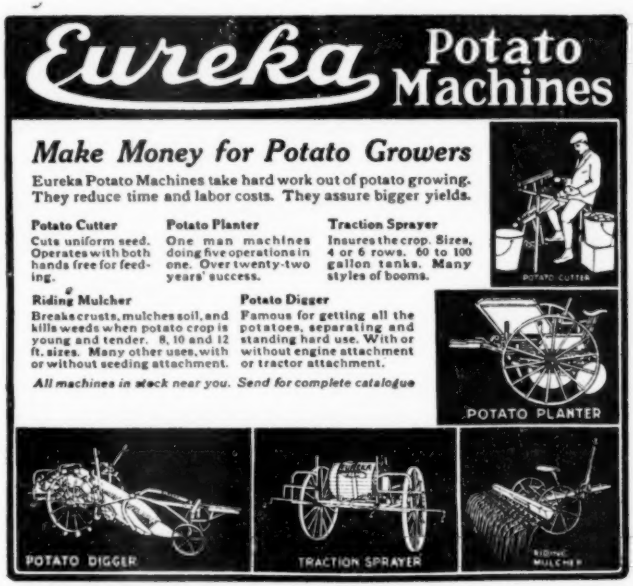
cars from the Norfolk section and 20,000 from Eastern Shore points, while Maryland, East Shore had reached a record of 2,500 cars, with considerable yet to come. Alabama shipped 3,100 cars of potatoes this spring, as against 2,100 in 1927. Movement from Kansas and Missouri was somewhat delayed and restricted, but probably will reach a fairly high mark, with any improvement of prices. Oklahoma fell a little short of its 1927 record, and was credited with only 1,950 cars. New Jersey, Long Island and other main-crop states were becoming active during August. Everything points to an abundance of potatoes and moderate prices.

Notes

COLORADO

Prices paid the growers for their earlies in Colorado, $1.00 to $1.25 per cwt. Some very good Early Ohios. Home grown Irish Cobblers from western slope Colorado and Utah good. The late crop in some sections looking very good, some fair and some not so good.

—LOU D. SWEET.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CONNECTICUT

The fact that excellent seed potatoes may be grown in Connecticut has been brought very forcibly to the attention of the interested potato growers of the state by Mr. B. A. Brown, assistant agronomist of the Storrs Agricultural Experiment Station of the Connecticut Agricultural College at a field day held at the College, July 12. Six years ago the Experiment Station set out to find why potatoes rapidly "ran out" if planted continuously in Connecticut without introduction of northern-grown seed, and the conclusion has been reached that this running out has been due almost entirely to the degenerative diseases, namely leaf roll, mosaic, spindle tuber, etc. Inasmuch as the diseases have been proved to be transmitted by insects, the method of control lies in keeping the seed plots free from disease and disease-carrying insects.

This was easily accomplished by raising the plants under cloth cages. Over a period of years, high yielding, disease-free potatoes were produced from seed grown in this manner. This method, however, is chiefly of experimental importance because the amount of seed that can be grown under cloth is comparatively small. The plan which has brought nearly as good results, and which may prove of commercial value is as follows. The seed is carefully selected as to freedom from disease. The seed-growing plots are located more than a thousand feet from any other potatoes to prevent the spread of any insects to the plots and heavy roguing practiced to eliminate any diseased or doubtful plants in the plot itself.

The results have been most gratifying, as the seed potatoes raised in this manner for six years are giving as good or even better yields than the original stock or any strain of certified seed on the market. The chief difficulty under Connecticut conditions is in preventing the spread of insects, particularly aphids from neighboring diseased fields. This is practically impossible in some sections on account of the huge number of aphids and the proximity of large acreage of potatoes. Mr. Brown was careful to make it clear that he did not recommend the growers to adopt this method commercially but was merely pointing out its possibilities.

Following this an inspection of the Experimental plots was made which bore out Mr. Brown's statements, the plots planted with seed grown in this way apparently being the equal if not the superior of anything else in the field. At the same time, the various degenerative diseases were pointed out to any one who was not familiar with them.

In the discussion which took place, a number of the growers expressed dissatisfaction with the variable quality and amount of disease frequently found in certified seed and the hope that

this plan would prove of commercial importance so that they might be able to raise a superior quality of seed. Some skepticism was shown by others present as to whether the growers could and would take the trouble to rogue properly, or be able to recognize the diseases in order to rogue intelligently. Mr. Owens, the Extension Agronomist, pointed out that a superior quality of seed would warrant the expenditure of considerable extra time by the growers. In conclusion, I would say that the average farmer attending this conference was impressed with the results, and with the fact that the Experiment Station was up and doing.

—M. B. C.

GREAT BRITAIN

The English Council of Agriculture are vigorously pushing the question of improved methods of sorting, grading, and marketing of "ware" potatoes; the organization of the export trade in seed potatoes, including the prohibition of export of any consignment which has not been inspected and certified by the Ministry; and dealing with surplus crops of "ware" potatoes in seasons of plenty by export, drying and preserving for food for men and animals, and by manufacture into what is known as "potato crisps." It is interesting to note that at a recent conference of representatives of potato growers, wholesalers, and retailers, standard grades for "ware" potatoes were proposed as follows: Specials, with a minimum diameter of two inches; Selected, with a minimum diameter of 1¾ inches; and Standards, with a minimum diameter of 1⅜ inches—all grades to be clean, healthy, true to type, and free from serious defects. Specials being allowed what is called a "tolerance" of 4 per cent defective. Selected being allowed a tolerance of 5 per cent defective, and Standards being allowed 6 per cent defective. The defects are—being undersizd, damaged, and having soft rot, wireworm or other disease. In all grades, not more than 4 per cent of dirt, etc., is proposed to be allowed in potatoes loaded prior to 1st November each year, and not more than 2 per cent thereafter. The proposed system of grading is to be demonstrated by the Ministry at the Royal Show at Nottingham.

—THE NORTH BRITISH AGRICULTURIST.

CANADA

The Dominion Fruit Branch July report on the Canadian potato acreage indicates a 2% increase over 1927 with 581,300 acres, as compared with 572,373 last year. All provinces report a slight increase in acreage with the exception of Saskatchewan and British Columbia, the latter showing 13% decrease. Correspondents state moisture and growing conditions to be favorable for this crop through the Dominion. It is reported from

the Red River Valley in Manitoba that heavy rains last month destroyed considerable acreage in that section. A survey of the potato situation in New Brunswick shows that the fields are patchy, there being many plants missing in the rows. It is expected this condition will reduce the yield. At this date it is too early to estimate production. Early potatoes are moving freely from British Columbia and Ontario but market conditions are disappointing.

—J. T.

NOVA SCOTIA

Although potatoes slumped somewhat this spring, the grower has not been disheartened. The more cautious are maintaining their usual acreage but enough seed was saved to provide a 10 per cent increase. This increase may not materialize, however, as planting has been greatly delayed by frequent heavy rains. As late at June 12th, districts usually finished before this date, had scarcely begun to plant. The increasing interest in certified seed continues. It is too early to arrive at a reliable estimate, but it is certain that a greater proportion than ever of the potato crop of the province will be planted with certified seed.

—W. K. McCULLOCH, Kentville N. S.

QUEBEC

Potato planting operations were practically finished in Quebec about June 20th. The weather has been very unfavorable for the planting of seed potatoes, and this has caused many to delay planting. In the lowlands, the stands are quite spotted, especially where much of the seed was injured by standing water shortly after planting. The season of 1928 shows an increased interest in the growing of certified seed potatoes in Quebec, with an increase in acreage of over 100% compared with last year. The planting of commercial stock was about the same as last year.

Many growers who never sprayed before are preparing to spray or dust this season, so the crop will be better cared for than before.

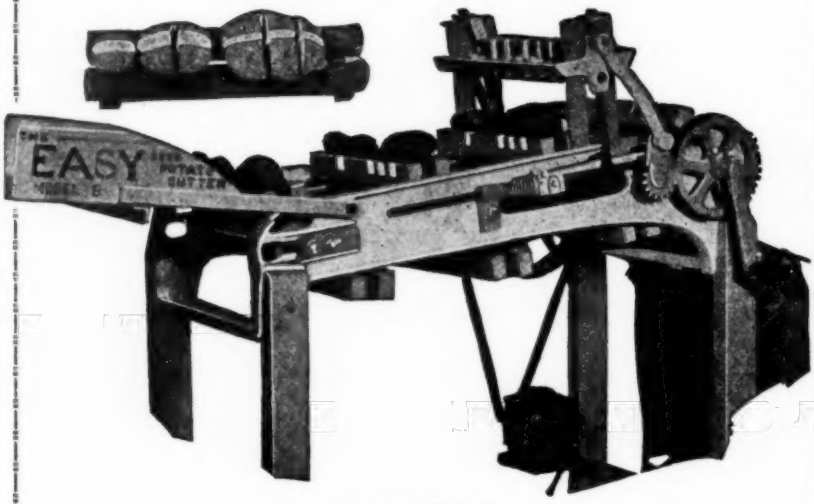
—B. BARIBEAU.

NEBRASKA

The characteristics of the early potato crop in Nebraska have been much rhizoctonia and black leg, a very high yield and low prices with commercial regions hesitating to dig at the present time.

In the western or late area the stands are unusually poor, due to seed piece rotting. The weather during June was unusually cool and wet with a period of hot weather in early July followed by another period of damp weather. Many of the rains were driving storms that packed the ground. The result-

The New Simplified E-Z-Way Seed Potato Cutter



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To insure good healthy stands it is necessary that the seed is fresh cut, full of sap and vitality, and also uniformly cut, so that the planter can do accurate work. This alone insures perfect stands of vigorous plants.

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ing lack of aeration was probably responsible for much seed piece rotting. Rotting seemed to be in proportion to the relative size of cut surface exposed

In the certified fields we seem to be able to see results from previous work, in that fields planted from "approved" lots of seed, continue to show a very low disease content. More will be written in a later number of the "Journal" concerning the "Index Seed Improvement" program.

Present prospects indicate that the late Nebraska crop will not be as large as the acreage would indicate, due to poor stand and slow early growth.

The annual potato tour was held August 13 to 16, starting at Kimbal and terminating at Hay Springs.

—H. O. WERNER.

NEW YORK

There has been a 26 per cent increase in the acreage of potatoes entered for certification this year. Fields are, in general, in very good growing condition at this time. The late blight is reported to be rather extensive on Long Island a little being reported in some of the upstate fields in Western New York. There appears to have been somewhat of a revival of interest in spraying and dusting for blight control. Spraying is still much more common than dusting.

One of the most important potato projects now under way in New York is that of potato storage. The writer is engaged in a survey of present storage facilities and construction throughout the state. Personal visits are being made to all of the special types of storages other than house cellars. A special summary of potato storage investigation in published form is being made which, together with the survey, it is hoped will furnish a basis for potato storage research work, and make it possible to recommend desirable types of storage available with present farm facilities. —E. V. HARDENBURG.

The 1928 Blue Tag Potato Tour, July 30-31, was a big success. On the invitation of the New York Cooperative Seed Potato Association about fifty men from Long Island, a number from New Jersey, Pennsylvania and West Virginia met the members and friends of the Blue Tag Association at the court house, Cortland, N. Y. for the start of the tour Monday morning, July 30th.

The potatoes were looking fine and the prospects for a good seed crop never seemed brighter. The disease counts were very low especially in the Rurals and according to all that could be seen on this tour purchasers of New York State Certified seed in 1928 are sure of good value. —GEORGE WINFIELD LAMB.

Review of Recent Literature

DO POTATO VARIETIES DEGENERATE IN WARM CLIMATES?

JOHN BUSHNELL, Ohio Agricultural Experiment Station

Reprinted from the Journal of Heredity (Organ of the American Genetic Association), Washington, D. C., Vol. XIX, No. 3, March, 1928

Degeneracy, or "runningout," of potato varieties is prevalent throughout the United States, but is particularly serious in the southern and central regions. Most investigators today attribute the loss of vigor wholly to virus diseases. But in spite of the recognized importance of these so-called degeneration diseases, the view persists that unfavorably high summer temperatures, entirely aside from infectious diseases are, in some degree, responsible for the degeneration.

In Ohio and some other central states which are now certifying seed potatoes, the question is of particular interest. Certification officials proceed on the assumption that unfavorable weather conditions are not injurious to the reproductive value of the tubers.

At first this assumption was based upon the genetic theory of the constancy of the hereditary complex in vegetative reproduction, rather than upon specific studies with the potato. As the work in Ohio has proceeded, however, the position appears to have been justified by comparative tests of local seed potatoes with certified seed from northern Michigan. During four years that such tests have been conducted, the disease-free Ohio seed has yielded as well as northern seed.* Due to the difficulty of controlling virus diseases, the production of certified seed in Ohio is still very limited; but, aside from disease, there is no indication in comparative tests of any degeneration directly due to high summer temperature.

A Ninety-Year-Old Variety

Four years, however, is an inadequate period upon which to base a conclusion that slow degeneration is not occurring. Consequently, a search was instigated to discover potatoes that had been grown for long periods in Ohio. The most interesting instance that has come to the writer's attention is an old variety, called the Long John, which is being grown by W. A. Lewis on his farm, ten miles west of Wooster. According to Mr. Lewis, the variety was brought to this vicinity from Pennsylvania by his grandfather, in 1836, and has been grown by the family for table potatoes ever since.

A sample of the Long John was grown at the Experiment

Station in 1926 in comparison with the modern Russet Rural, the leading variety of northern Ohio. The Long John showed no symptoms of any virus disease. The tops of the old and new varieties were very similar. The tubers of the old variety, however, were irregular and unattractive when judged by modern standards. Unfortunately, as the autumn was very wet and some tubers rotted in the ground in both varieties, no accurate comparisons of yield were possible, although there were indications that the old variety yielded slightly less than the new. This may be taken as evidence of degeneration; but in view of the fact that in the historical succession of varieties, new varieties supplant the old, both because of superior yields as well as of superior quality, slightly lower yield in an old variety is certainly not conclusive evidence of degeneration. The variety then stands as an example of a high degree of vigor after 90 years of adverse summer temperatures in Ohio.

Two lesser instances may be mentioned. A prominent grower of south-central Ohio has maintained one of the Rural varieties (Carman No. 3) in a high degree of vigor for 15 years. In recent seasons his yields have been more than 200 bushels per acre above the state average. His high yields are in part due to his practice of applying a straw mulch. In view of Emerson's success with mulch in Nebraska,† it is possible that the straw mulch may be partly responsible for the maintenance of vigor in this Ohio strain.

The other instance is that of a seed potato specialist in northern Ohio, who, since 1906, has produced excellent seed stock on a commercial scale. As a means of reducing the spread of virus diseases he has adopted the policy of delaying planting until late June, a practice which places tuber development during the cooler weather of late summer and fall. However, in some seasons hot weather prevails during late August and early September, and as yet his stock shows no sign of degeneration. At present his seed potatoes are widely sought in northern Ohio, and yield as well as certified seed from farther north.

These three instances, together with the recent success in certifying seed potatoes in Ohio, are in accord with the view that degeneration of potatoes is entirely due to diseases rather than to any direct effect of high temperature, itself, upon the hereditary complex. From a genetic viewpoint there is no reason why further efforts should not be put forth to produce and maintain seed potatoes in this climate.

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*Bushnell, John, and P. E. Tilford. Suggestions on the method of producing seed potatoes. Ohio Agr. Exp. Sta. Bimon. Bul. 12:41-44. 1927.

†Emerson, R. A. Home mulched vs. northern seed potatoes for eastern Nebraska. Neb. Agr. Exp. Sta. Bul. 146. 1914.

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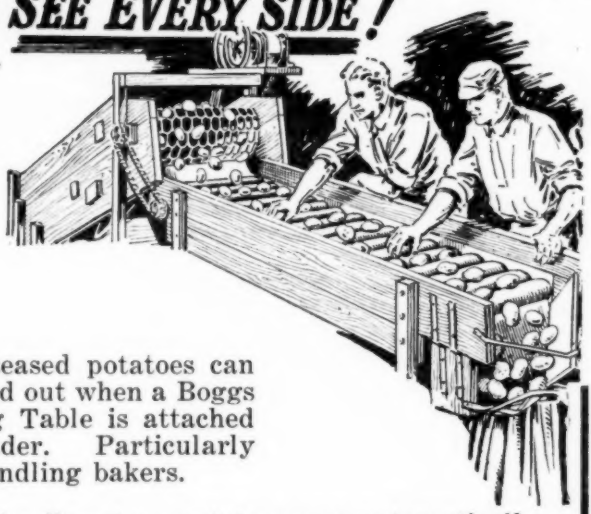

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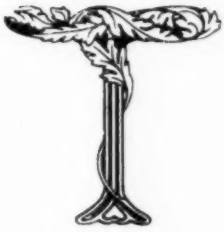

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Why We Should Eat More Potatoes

JOHN HARVEY KELLOGG, M. D., LL. D., F. A. C. S., Medical Director
Battle Creek Sanitarium

Since Count Rumford, a New England Yankee, soon after the close of the American Revolution, taught the people of Bavaria to make potato soup, the potato has steadily grown in popularity in central European countries. During the Great War, the potato rendered the same service to Germany that corn did to this country. The per capita production of potatoes in Germany before the war was 24 bushels, whereas in this country we produce for each inhabitant scarcely four bushels per annum.

In this country we have not yet begun to appreciate the value of the potato as an article of food. The Americans are essentially grain eaters. There are many reasons for this. The potato requires intensive cultivation and much hand labor, whereas cereals can be readily produced in enormous quantities by the use of machinery alone. Cereals, particularly corn, wheat and oats, have been extensively exploited by great manufacturing companies, and the American people through the medium of magazine and newspaper advertising have been educated in the use of cereals to such an extent that ready-to-eat foods prepared from wheat or corn have become the conventional staples of the American breakfast and fill a large share of the space on grocers' shelves.

These breakfast foods have performed a most useful service for the American people by lessening the consumption of butchers' meat and replacing to a large extent the indigestible fried dishes of various sorts which formerly constituted the American breakfast, and have no doubt been a factor in the marked lowering of the American death rate which has occurred within the last few years. Nevertheless it must be ad-

mitted that while bread has for ages enjoyed its deserved reputation as the staff of life, it is not altogether commendable as a chief source of human nourishment. The profound studies of our nutrient needs which have been made in recent times by numerous eminent investigators have shown that cereals possess certain characteristic qualities which render their too free use not only undesirable but a possible source of serious systemic injury.

More than 30 years ago the eminent Swiss bio-chemist Professor Bunge called attention to the fact that because of the great excess of phosphoric acid in cereals their free use tends to lessen the normal alkalinity of the blood and tissue fluids, thus working great injury, for nothing is more important for good nutrition, resistance to disease, high efficiency, endurance and longevity than the maintenance of a high standard of blood alkalinity. When the alkalinity is lowered by the overaccumulation of acids in the blood and tissue fluids, there is increased susceptibility to colds, to influenza and to such maladies as pneumonia and other grave acute diseases. The chance of recovery from an attack of infectious disease such as typhoid fever or influenza, is greatly lessened when the blood alkalinity is lowered. The chief reason for this is that the blood is our chief defense against the attacks of germs which give rise to infectious disease. When the blood is invaded by these enemies of life and health, certain of the blood cells, known as leukocytes, attack the bacteria and if successful destroy them. The fighting ability of the blood cells in their defensive battle depends upon the state of the blood. When it is normally alkaline the leukocytes are highly active and pursue and destroy the invading bacteria with great vigor, but when the alkalinity of the blood is lowered by an excessive intake of unoxidizable acids such as the phosphoric acids found in great excess in wheat, corn and other cereals, the fighting power of the blood cells is diminished.

It is now believed by many eminent investigators that an excess of acids circulating in the blood tends to cause premature hardening of the arteries, or arteriosclerosis, and in this way encourages the development of Bright's disease and other degenerative maladies.

Although the preponderance of acids in cereals was pointed out many years ago by Bunge and other authorities, it is only within the last few years that their importance has come to be appreciated by students of human dietetics. This has led to an exhaustive study of foodstuffs with special reference to their alkaline and acid properties.

The character of a food is shown by its ash. Food is body fuel and when burned in the body leaves a residue or ash the

same as when burned in the ordinary way. The acids and bases, or alkalies which compose this residue, are chiefly eliminated by the kidneys. When this ash contains a preponderance of acids, as in the case of cereals, the effect of the food is to lessen the alkalinity of the blood. On the other hand, when bases, or alkalies, predominate in the ash, the effect of the blood is to increase alkalinity and in so doing to increase resistance to disease, vigor and endurance.

The ash of the potato is more highly alkaline than that of any other of our common foodstuffs, its ash containing about ten times as much potash as does that of fine flour bread. This fact gives to the potato great importance as a dietetic means of maintaining the alkalinity of the blood and tissue fluids, which modern science has shown to be so important that a loss of alkalinity so great as the difference between ordinary pipe water and distilled water, will cause instant death.

It is not to be understood, of course, that cereal foods should be altogether avoided as unwholesome. They become injurious only when too freely used and made to constitute the major part of the diet, and especially when used in conjunction with meats or eggs. It is only necessary to bear in mind that cereals of all sorts are acidifying foods, and to combine with them other foods in which the alkalies predominate. Alkalies are found in large excess in the ash of fruits and vegetables of all sorts, but the potato is particularly rich in alkaline elements and hence is perhaps better suited than any other foodstuffs for neutralizing the excessive acidity of cereals. Milk is a neutral substance; hence the oatmeal, milk and potato diet of the Irishman is a well balanced and physiologic dietary, and it is doubtless to this fact that the Irish owe their great vitality and endurance and, particularly, their wonderful longevity, which exceeds that of any other European nation, with the exception of the natives of Bulgaria, whose diet is very similar.

A bread and meat dietary, however, as has been frequently pointed out by McCollum, and, as the writer has maintained for more than half a century, is most unwholesome. Bread supplies acids in excess, and steaks, chops and meats of all sorts, contain a still greater excess of acids. Many cases of Bright's disease give a history of liberal meat consumption and scanty use of vegetables and fruits, and thousands of doctors are daily saying to their patients, "Cut out meats." Scientific and up-to-date doctors are beginning to add to the instruction to avoid meats, "Eat more potatoes."

Another unphysiologic combination is the common breakfast dish, poached egg on toast. Both eggs and bread are highly acid foods and their use tends to surcharge the blood and tissues with acids, and to burden the kidneys with superflous

work, since one important function of these organs is to maintain the alkalinity of the blood at a proper level by removing any excess of acids.

Substituting the potato for bread, we have in the alkaline tuber and eggs, an entirely wholesome combination, since the alkalinity of the potato will balance and neutralize the acidity of the egg. For a complete balance, one small potato is required for each egg. From the standpoint of palatability, the egg-potato combination is entirely satisfactory.

The effect of a diet upon the alkalinity of the body fluids, is readily shown by the urine. Acid foods increase the acidity of the urine, while alkaline foods lower the acidity. The acidity of the urine is thus an indicator of the effect of a diet upon the tissue fluids. The urine of persons who subsist largely upon cereals and meat or eggs, is always highly acid. Not infrequently the urine of such a person will be found to be fifty times as acid as it ought to be or even a hundred times more acid than normal. The labor of eliminating this enormous excess of acid wears the kidney out prematurely and undoubtedly shortens life, and greatly lessens efficiency.

The writer has no doubt that this is one of the great causes of the steadily lessening maximum longevity in this country. Centenarians are rapidly disappearing. Potato-eating Ireland furnishes more examples of great longevity than any other European country except Hungary.

The writer has for many years advocated very strongly an increased consumption of potatoes, replacing a part of the bread and other cereals which now enter so largely into the American bill of fare. The effort that is being made by the Potato Association of America to promote the cultivation of this wonderful tuber, is highly commendable and will undoubtedly result in greatly improving the health and efficiency of the American people.

Editor's Note—This is the first of a series of articles by Doctor Kellogg. The next article will appear in an early issue of the American Potato Journal.

Annual Meeting December 27-29, 1928

The fifteenth Annual Meeting of the Potato Association of American will be held in New York City, December 27-29, 1928. Detailed announcement of the meeting will be made in the November American Potato Journal.

It is urged that those contributing papers for this meeting communicate with the secretary at once and that abstracts of papers be filed with the secretary on or before October 15, 1928.

How Late Should We Spray Our Potato Fields?

WM. STUART, United States Department of Agriculture, Washington, D. C.

The question as to when it is safe to discontinue the application of liquid or dry bordeaux mixture as a protection against late blight is one which has to be decided each season by each individual potato grower. Many years observation has shown conclusively that all too frequently growers have ceased spraying before it was really safe and as a result have in many instances suffered heavy losses through late blight infection of the tubers when perhaps an additional application might have largely, if not entirely, prevented the infection.

In some respects a late attack of late blight is much more serious in its consequences than a midsummer attack of similar severity on the foliage of the plants. On first thought this statement may seem untrue, but it is believed, however, that in most cases it can be sustained. Generally a midseason attack of late blight is followed by a period of warm dry weather which checks the progress of the disease and kills the spores which have fallen on the surface of the ground. If no heavy rains have occurred prior to the destruction of the spores and if the crop was not foolishly harvested when the disease was in an active stage of growth there will be little or no late blight decay of the tubers.

The folly of harvesting potato fields attacked by late blight was well exemplified in Aroostook County, Maine, in 1927, when an attempt was made in August to harvest and market some Irish Cobbler potato fields in which late blight was still active with the result that several carloads of this stock had to be dumped in Boston harbor because such a large proportion of the potatoes had developed tuber rot. This experience put a stop to further harvesting activities until later in the season when the disease had died out, at which time a negligible per cent of tubers were found to have been infected with late blight. The loss sustained from a midseason attack of late blight is therefore directly proportional to the severity of the leaf and stem infection and the consequent effect such injury has on the further development of the tubers.

On well sprayed fields there should of course be little if any foliage injury because if the grower has a good power sprayer his spray program calls for frequent applications during the midseason growth of the plants. In far too many instances, however, the grower feels that his spray job is completed when the plants have reached their full development as to size and are beginning to show signs of ripening. If during the period intervening between this stage and that of complete ripening

of the plants the right kind of temperature and moisture conditions prevail there is almost certain to be an attack of the disease in late blight infected regions.

It is never safe, therefore, in such regions to discontinue bordeaux applications as long as there are green leaves on the plants for even a light infection at this time may result in tuber rot. The word may is intentionally used in the preceding sentence because infection of the tubers is dependent on two factors: (a) heavy rains which may bring live spores in contact with the tubers and (b) harvesting the crop when late blight spores are abundant on the surface of the ground or on the plants themselves. In the operation of digging the crop the potatoes inevitably come in contact with some of these spores and wherever the surface of the skin is broken it affords a possible invasion of the disease with a consequent decay of the tubers. Furthermore, and this is the serious feature of it, such infection cannot be immediately detected and as has already been shown results in loss to the shipper if moved immediately to market. On the other hand if the crop is stored the grower is almost certain to have the rather doubtful privilege of carrying out a considerable proportion of decayed tubers during the storage period. Frequently these losses may amount to 25 or even 50 per cent of the entire crop.

There is another angle to tuber infection at time of harvest which should be mentioned and that is the extreme difficulty of detecting every infected tuber when grading them for market. Some buyers refuse to handle such potatoes knowingly, as they invaribly are a source of grief to the shipper.

A brief comparison of the relative effect of a midseason and late attack of late blight shows that the former arrests the growth of the plants and consequently cuts down the yield but causes little if any injury to the tubers unless very heavy rains occur or the grower is unwise enough to harvest the crop when live spores are still present. In the case of a late attack it is often so mild as to be unsuspected and as the infection occurs at or about the time the tubers have reached full development there is little reduction in yield. The chief loss is from tuber decay which in many instances is probably unavoidable so far as postponement of digging is concerned because in many cases it is a choice between late blight tuber infection or field frost injury.

In this discussion the sole object has been to emphasize the danger of discontinuing the spray program while the plants are still alive. Such a procedure might be perfectly safe three years out of five but in late blight regions no grower can afford to take the chance of having his crop attacked by this disease toward the end of the growing season unless weather conditions are such to preclude the possibility of infection.

Even in such cases the grower must be prepared to resume spraying at the first suggestion of late blight weather conditions. It is doubtful, therefore, whether the saving of one or more additional spray applications is justifiable under even the most favorable conditions.

Weed Control and the Potato Virus Problem

W. D. VALLEAU and E. M. JOHNSON, University of Kentucky, Lexington

In raising certified seed potatoes the most important consideration in Kentucky, and perhaps likewise in the more northern potato sections, is obtaining a stock of seed potatoes relatively free from virus or degeneration diseases. The grower is not so much concerned with distinguishing the types of virus disease as he is with methods of their elimination. The standard method of eliminating virus diseases is that of pulling out, as soon as recognized, all diseased plants and removing them from the field. This method, while proving highly successful from a commercial standpoint, has not been as successful as might be expected from the standpoint of complete elimination of the disease.

It appears probable, under Kentucky conditions, that a feature of importance in lowering the effectiveness of roguing may be the presence of certain weeds commonly present in potato fields, which may act as reservoirs of infection from year to year.

While the evidence for infection of potatoes from weeds is not conclusive, it appears to be sufficient to raise the question as to whether the potato grower would care to take the risk of leaving the weeds in the vicinity of his high-grade potato stock when a little extra work will eliminate them and the consequent danger to potatoes.

In working with the virus diseases of tobacco, the writers have found that certain of them are always more abundant in or near fields where potatoes have previously been grown for several years. In one field, for example, where Cobblers have been grown from time to time for the past 14 years and carefully rogued during that time, five virus diseases developed in abundance in tobacco, of which three, at least, go readily to potatoes and may be transferred from them again to tobacco. A field on the Experiment Station farm at Lexington has been under observation for several years, in which at least nine virus diseases, other than the true tobacco mosaic, develop each year in tobacco. A portion of this field was planted to a po-

tato variety test for at least two years, about 20 years ago. The pasture connecting the two parts of the field has been in bluegrass continuously since that time and is nearly a mat of horsenettles *(Solanum carolinense)* and contains numerous groundcherries *(Physalis sp.)*. Many individuals of both species are infected with a virus. The supposition is that the weeds became infected from the potatoes at that time and, as they are perennials, have carried the diseases since that time. That the virus diseases of tobacco, grown in the vicinity of this field, originate largely from the weeds has been clearly demonstrated, both by transferring the viruses from the weeds to tobacco and back to weeds again and also by eliminating the weeds in and about one tobacco field, thereby nearly completely controlling these virus diseases, and allowing them to remain in and about another tobacco plot with the result that, by the middle of summer, the tobacco in the later was fully 85 per cent infected.

The fact that several of these virus diseases may be transferred to virus free ***seedling*** potatoes and then retransferred to healthy tobacco and that the viruses may likewise be obtained from naturally infected weeds or transferred to healthy weeds, where symptoms are produced, seems to be sufficient evidence to warrant the recommendation that as much attention be given to the elimination of these two genera of perennial weeds as is usually given to the elimination of potato plants known to be infected with one or another of the virus diseases.

The problem of elimination of these weeds is not so simple as would at first appear. They sometimes root as deeply as 30 inches, and in some cases when cut off 16 inches below the surface have been found capable of pushing up through this amount of packed soil. In sod, however, they appear to send rootstocks for a considerable distance parallel to the surface and not to root so deeply. In cultivated fields, where clean culture is used continuously, the rootstocks are plowed up and cut into small pieces in working the sod, and each of these is then capable of growing and making a vigorous plant. The method which we have employed in cultivated fields, in ridding them of the weeds, is to dig each individual plant with a spade, preferably a tiling spade, put it into a sack hung over the shoulder and, when the sack is full, carry it to the road where it is emptied. Here, in the sun, the roots rapidly die. As the chief method of propagation, in cultivated fields, seems to be by these cuttings of rootstocks rather than by seed, the method, although tedious the first time over the field, becomes simple from that time on. Removal in pastures is not so simple, but the weeds have been markedly reduced by pulling the plants up, thus breaking the individuals off at the underground rootstock. In this way they become weakened and have less chance

of survival in competition with grass than when left unmolested.

In Kentucky, where only second-crop potatoes are used for seed, if the weeds are removed from cultivated fields by hand, they may very probably be handled in nearby pastures by allowing them to grow to the flowering stage, when they may be moved close to the ground just before second-crop seed potatoes are planted. Then, pulling by hand in pasture land in the vicinity of potato fields or one or two more mowings during the fall should be effective in eliminating them as sources of infection to nearby potatoes.

While it has not been clearly demonstrated that the weeds do act as a source of the virus diseases of potatoes, the evidence seems sufficiently conclusive to warrant their complete destruction on farms where certified seed potato stock is being grown year after year.

The New Jersey Potato Industry

W. C. LYNN, New Jersey Department of Agriculture, Trenton

If production figures alone were taken into consideration, the fact that New Jersey annually accounts for two per cent of the national production of potatoes would indicate that this state is relatively unimportant in this line of agriculture. Actually, however, a limited seasonal production creates an importance worthy of consideration. New Jersey potatoes are available in a few markets for ten or eleven months in the year, but approximately 80 per cent of the annual crop is classed as "second early," and for the most part is marketed between the last few days of July and the middle of September. During the past five years one-fourth of the country's August shipments have originated in this state.

The commercial producing area of the state is in two districts. The more important of these, known as "Central Jersey," is comprised of Mercer, Middlesex and Monmouth counties, and extends east from Trenton to within a few miles of the coast. The other district, known as "South Jersey," including Cumberland and Salem counties, is about thirty miles south of Philadelphia just east of the Delaware River. There are two other counties lying between these two districts which are producers of a second early crop, but which truck to nearby markets, principally Philadelphia, and do not ship in carlots.

Changes in Variety

A radical change has taken place in the potato industry of the state within the past few years. Ten years ago the major commercial variety grown in Central Jersey was the American Giant, with only small acreages of Irish Cobbler and Green Mountain in evidence. Today the situation is reversed. Most of the commercial acreage in that section now is Cobbler, and American Giant acreage has practically disappeared, comprising less than one per cent of the total. In the same period Green Mountain acreage has also made some increase. The American Giant was of inferior quality but was grown largely because it was believed to be more scab resistant and a better yielder than the Green Mountain or the Irish Cobbler. Experiment Station tests over the last six years have demonstrated that it is more resistant to scab but that is not a better yielding variety. These tests, which included a number of strains of each variety, showed an average yield over a five-year period (1921 to 1925 inclusive) of 189.3 bushels for American Giants, 192.4 for Irish Cobblers and 203.8 for Green Mountains. Quoting from Experiment Station Bulletin No. 454, which gives details as to these tests, "Very little effort has been made to improve the American Giant whereas all of the seed-growing sections have been devoting considerable attention to the production of the Irish Cobbler and the Green Mountain varieties. This unquestionably accounts for the fact that the two latter varieties have given larger yields than the former. The fact that the American Giant will not yield as well as the Green Mountain or Irish Cobbler and particularly the fact that the quality of these two varieties is greatly superior is sufficient reason for discarding the American Giant."

The commercial crop in South Jersey has for some years consisted almost entirely of Cobbler stock, although a few Green Mountains are grown. A late crop, planted in July, is produced in this section and moves by truck to nearby markets. For this crop the New Jersey Red Skin is commonly grown and usually finds a ready sale through those outlets.

For more than a decade prior to 1923 the total acreage of potatoes in the state ranged from 80,000 to 95,000 acres; in the latter part of this period following the war, the potato industry here was in a very unhealthy condition, with the result that many growers experienced heavy financial reverses. Since 1923 the total acreage has declined to between 50,000 and 60,000 acres. This reduction, together with the adoption of varieties of better quality, and improved cultural methods, has tended to stabilize the industry and placed it on a sounder basis.

Marketing

The commercial sections previously described begin shipping

carlots the last week in July, although no appreciable quantity is moved until early in August. Peak shipments occur in this month, usually between the 10th and 20th. Movement generally continues heavy until the end of the month, and by the middle of September almost all of the crop has been marketed. The heaviest daily shipments from New Jersey in 1927 amounted to 350 cars, which amount was shipped on two days, the 11th and the 17th of August.

A considerable proportion of the season's movement is through the hands of local dealers, although some large growers market their own production direct. The usual custom at the larger shipping points, at which a number of dealers operate, is for the grower to deliver his loads at a dealer's platform or warehouse where the stock is graded and the grower credited with a price based on the current market. Grading machines are in common use and many of the larger growers sack their stock at the farm and either sell direct or load on cars which are bought by dealers or sold on account. Field grading is practiced to a certain extent and is more prevalent in some localities than in others. However, the stock is sufficiently matured and the skins reasonably tight so that with ordinary care in handling there is no damage from machine grading. All rail movements today is in the common 150-lb. sack, loaded 200 to the car. Branded sacks, the use of which is an accepted principle in better marketing, are also in common use.

Distribution

During the past five years New Jersey has shipped an average of 6,000 cars annually. This is only half of the average quantity shipped yearly during the previous five-year period of 1918-1922, when the acreage ranged from 80,000 to 95,000 acres. This fifty per cent decrease is due not only to reduction in acreage but also to increasing movement by truck. Oridinarily, about half of the annual rail movement from New Jersey occurred in the month of August, but lately, with decreased shipments and increased competition, the August rail movement has comprised about three-fourths of the yearly shipments; the remainder roll mostly in early September and some in the last few days in July.

Ten years ago, during the height of New Jersey's heavy production of the American Giant, western markets were important receivers of potatoes from this state. In 1916 Chicago reported 1,100 cars from New Jersey, and Pittsburgh, Cincinnati, St. Louis and other western cities also bought large quantities. Since that time the amount of New Jersey stock sold in that area has dropped appreciably due to the poor variety grown and to new local sections opening up, offering competition with better quality. This loss of business is best reflected

by figures. In 1925, for example, only three cars of Jersey stock were unloaded in Chicago and but eight cars in 1926. In the latter year Detroit received 26 cars, Boston 38, Cincinnati six, and Milwaukee, Birmingham and New Orleans none.

Even with the great improvement in quality through complete variety change it has been difficult to regain many of the markets which a few years ago were important outlets for New Jersey producers. Last year, however, a great deal was accomplished along this line, and with good grading these regained markets should be held and many new ones added. Market conditions in 1927 were one of the uncontrollable factors which to some extent favored New Jersey distribution. The larger nearby markets were not in condition to handle as many cars as in 1926, which was a shorter crop year than usual. Consequently considerable effort was made to reach out to greater distances. Last year, therefore, markets in all of the states east of the Mississippi River, with the exception of the State of Mississippi, received varying amounts of New Jersey potatoes, and also two states further west, Louisiana and Texas. Increases in a few important markets, some of which are distant, together with decreases in nearby large outlets under poorer market conditions, are shown in the following table:

Carlot Receipts from New Jersey

Market	1926	1927
Akron	26	41
Albany	34	55
Birmingham	0	13
Boston	38	495
Chicago	8	151
Cleveland	202	225
Columbus	43	55
Detroit	26	223
Milwaukee	0	25
Newark	250	271
New Haven	1	46
New Orleans	0	33
Scranton	90	133
Tampa	14	48
Wilkes Barre	83	121
Worcester	21	52
Youngstown	49	76
Baltimore	106	59
Buffalo	156	72
New York	226	185
Philadelphia	387	334
Pittsburgh	375	336
Washington	199	125

In the last five years there has been a noticeable increase in the movement of the commercial crop by truck, and the innumerable local outlets offer possibilities for a still greater increase in this method of transportation. These outlets form a vast consuming power, for within a radius of sixty miles of Trenton there is centered one-tenth of the population of the United States. The usual quantity loaded on trucks for market delivery is 100 sacks but some six-wheel trucks in operation now carry 200 sacks, which is equal to a carload by rail. There are no definite figures regarding the quantity of potatoes trucked to market, but the general impression is that it is constantly growing. Taking the crop as a whole, including some stock produced for winter sale, an average of 53 per cent of the five crops from 1918 to 1922 were shipped by rail; from 1923 to the present time this proportion by rail has dropped to take in but 38 per cent of the state's production.

In considering truck movement of the second early crop which constitutes the majority of New Jersey's production, there are three seperate sections to be taken into account. In Central Jersey the present proportion shipped by rail is 64 per cent, leaving approximately two-thirds to be marketed locally, including truck movement. In the South Jersey area the greater proportion of the commercial crop is trucked to market, only 38 per cent moving by rail. Between the Central and South Jersey sections are two counties which annually produce about one million bushels of the state's commercial crop. However, practically no carloads move out of these counties and almost all of the stock is sold in or through the Philadelphia market in five-eights bushel baskets.

Competition

New Jersey has several formidable competitors among the second-early potato producers, best illustrated by the fact that in August 1927 the Eastern Shore of Virginia and Maryland shipped 1996 cars, Long Island 1554 and Kansas 1456. These three districts and New Jersey collectively accounted for 56 per cent of the total forwardings in the country for that month. Most of the remainder originated in Minnesota, Missouri and several Mountain and Pacific states. The movement from the Eastern Shore occurred of course during the first two weeks of the month, but represented an overlapping of seasons in the two areas. The Long Island carlot movement was much below that of New Jersey during the same period but considerable trucking from the Island to metropolitan markets increased the amount of competitive stock on hand. The majority of the Kansas stock moved in July along with the bulk of the Eastern Shore shipments, but nevertheless was present in sufficient quantity on some mid-western markets to compete

with New Jersey shipments to that section of the country in August. The following table showing average daily carlot movement from the several areas in 1927 illustrates in figures the competition from those states:

Average Daily Carlot Movement

Week of	Eastern Shore	New Jersey	Long Island	Kansas
July 25	475	30	5	80
August 1	176	131	19	46
August 8	111	233	46	62
August 15	28	206	50	26
August 22	11	181	85	48
August 29		104	92	48
September 5		91	108	22
September 12		65	93	24
September 19		16	50	14
September 26		11	71	2

Inspection at Shipping Point

Federal-State shipping point inspection has been available in New Jersey since the inauguration of this type of work in 1922, but not until the past two years has it received any steady recognition of its worth in the potato industry. In the 1926 season 423 cars were inspected at shipping point and last year the number increased to 756 cars, in each case representing a little more than 10 per cent of the state's carlot movement. Indications are for a continued increase in the voluntary use of this service because its merits are becoming more generally acknowledged by growers and dealers. To them its benefits are principally that it promotes grading and standardization; that it is a strong advertising point and so assists in making sales; and that it assists in forcing acceptance of cars of potatoes which are up to grade or which are sold and confirmed on a mutually agreed basis.

Conclusion

The New Jersey potato industry is constantly adopting new measures for the improvement of its business, of which the radical change in variety a few years ago was the first step. The general use of certified seed has represented another stage in advance, for prior to 1921 less than five per cent of the seed potatoes planted in New Jersey were certified, while in 1926, dealers handling 95 per cent of the seed potatoes in Central Jersey reported that over 90 per cent of the seed sold by them was certified, most of which was from Prince Edward Island. The widespread adoption of spraying and better cultural practices, the increasing attention to grading, more effective distribution, and now shipping point inspection—all

these are improvements in the industry. With the efforts of growers, dealers, the State Potato Association, the Potato Improvement Committee and other allied agricultural agencies centered toward one common end, New Jersey has established itself as one of the important potato producers of the nation.

Crop and Market News

Potatoes Marking Time

(Contribution from the Bureau of Agricultural Economics)

The potato market has fluctuated considerably during recent weeks, but was marking time about September 10, awaiting the clearance of mid-season supplies and further possible changes in the crop report. With production in Kansas and Missouri estimated nearly 50% heavier than last year, that region probably will continue shipping until October. Combined output of the two states to September 1 was 4,430 cars, compared with 5,015 the year before, which indicates that a considerable volume was yet to come. New Jersey also has a crop fully equal to that of 1927, but had shipped (by rail) only 2,735 cars by September 1, or about half as many as a year ago. It is the delay in harvesting these mid-western and eastern potatoes,—including Long Island stock,—that is causing some anxiety for northern and western shippers.

Early potatoes in the main-crop states are ready for digging, but most growers are leaving them as long as possible, in the hope of better prices. The Antigo section of Wisconsin reported f. o. b. range of only 75c-80c per 100 pounds during the forepart of September, while Early Ohios were bringing 60c -75c in southeastern Minnesota. Shipments figures show, better than anything else, the delay of the present season. By the opening of this month, 16 of the 19 surplus-producing late-potato states had forwarded only 6,740 cars, as against 11,745 the year before. The only sections, which were running ahead of last season's corresponding record, were Washington, central and southern California, and Pennsylvania. The most important shipping states are far behind their 1927 totals to date.

Production Estimates Increased

According to August condition, a total potential crop of 460,000,000 bushels of potatoes is now expected, as against 407,000,000 last year and the previous high record of 453,000,000 bushels, established in 1922. Michigan, Wisconsin, and Minnesota together expect nearly 103,000,000 bushels, or one-fourth more than in 1927. Of the 53,000,000-bushel increase over last season, about 10,000,000 were in early shipping states. The 16

deficient producing states, several of which are most active shippers during the summer months, have about 15,600,000 bushels of the excess over last year's total. But the 19 important main-crop states, which furnish nearly all of the carlot shipments after September, have but 27,000,000 bushels more or only 10% greater production than in 1927. If the crop this season is carefully graded and if culls and No. 2 potatoes are largely left on the farms, the market position of No. 1 stock may not be so bad, after all. The late crop in eastern states will not be excessive. With a 20% increase over last year, the North Central states appear to have 21,000,000 bushels more than they produced in 1927. The western crop is likely to be below last season's heavy total, but still far above average.

Early-September Markets

Kansas and Missouri sacked Cobblers, many of them dirty, were down to low range of 57c-75c per 100 pounds in the Chicago carlot market, while Minnesota Early Ohios ruled 85c-90c, Nebraska stock 85c-$1, and Wisconsin arrivals about $1. Hauling was rather heavy in the Antigo section of Wisconsin. The Kaw Valley price on Cobblers held about steady around 55c, and potato shipping points in New Jersey reported a range of 95c-$1. Eastern Shore stock strengthened a bit in eastern markets at $2-$2.50 per barrel. These potatoes have been largely crowded off the Chicago market by liberal receipts from territory closer to Chicago. General jobbing range on arrivals from Pennsylvania, New Jersey and Long Island was $1.05-$1.45 per 100 pounds. New Jersey was shipping an average of 125 cars daily, compared with 100 from the Kansas-Missouri territory. Movement from the important northern and western states had increased to an average of 200 cars each day, compared with 400 daily during early September, 1927.

Notes

NEW YORK

The rainfall of the last month has been heavy enough to give heavy and healthy vine growth over the greater part of the east. At the same time, while there are large areas where late blight has gained a start, there are not many places it is yet serious enough to badly reduce yields. One to two weeks of general rainy weather would destroy a large proportion of eastern vines, as the disease is present and needs only more moisture to develop.

Southern New York shows less tip-burn than average season. Stand losses from seed rotting and floods heavier than average, losses from rhizoctonia probably less.

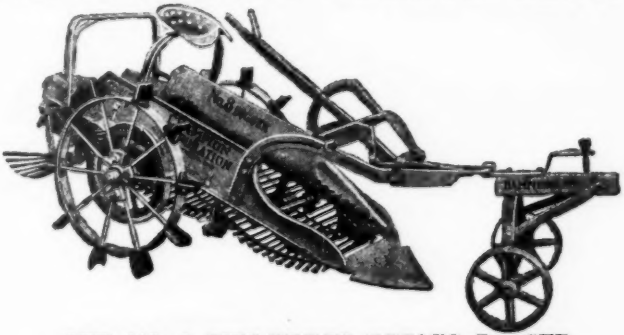
Yield per acre certainly within radius of 100 miles and probably much further will be a weather proposition for the rains of the next six weeks to determine. (August 24).

—DANIEL DEAN, Nichols, N. Y.

MINNESOTA

As a result of a week's tour in the potato sections of Minnesota beginning July 31 and ending August 6, a fairly good idea of the condition of the potato crop was obtained in the localities visited. These included University Farm, St. Paul, Minnesota; Osseo, Anoka; Elk River, Moorhead, Sabin, Dilworth; East Grande Forks and adjacent territory, Crookston, Thief River Ralls, Fosston and Hollandale. Generally speaking the condition of the crop was good and the character of the seed stock being grown was noticeably improved over what had been observed in former visits. There were, of course, as in many other sections, plenty of poor commercial fields. In the Red River Valley, especially in Clay County, poor stands were rather general. This was attributed to having been planted when the soil was hot and dry and to excessive rains later on and low soil temperatures causing a large per centage of the seed pieces to rot.

O. K. CHAMPION POTATO DIGGER



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An outstanding example of the slowness of some growers to recognize the value of good seed was observed in Clay county where a potato grower had planted his 400 acre crop with the most nondescript lot of seed imaginable. It contained about all the virus diseases known, besides rhizoctonia, fusarium wilt and blackleg and in addition a goodly percentage of varietal mixtures. It is safe to say that the use of poor seed in this particular instance will result in a direct loss in yield of at least 30,000 bushels of potatoes. The remarkable thing about this particular case is that the man is regarded as a successful potato grower and has never grown less than 360 acres for the past 20 years or more and has kept accurate his account of prices received for his crop. From 1911 to 1926 inclusive his account books shows an average sales price of $1.06 per bushel at shipping point.

The potato crop in the Red River Valley in Polk county was found generally better, particularly as to stand, than in Clay county. To those who have been familiar with potato production in the Valley, the change or shift over from the Early Ohio to the Irish Cobbler and the Triumph is quite noticeable.

In the Hollandale district approximately one-half of the 15,000 acres of peat, muck and mineral soils reclaimed by the Payne Investment Company has been planted with potatoes this season. Heavy rains the last week of July had caused some damage to the potato and celery crop on the less well drained areas. Outside of the damaged portions of some fields the crop was looking fairly good. On account of deterioration in the seed stock planted, there will be a considerable acreage of the 1,500 entered for certification rejected owing to the presence of too high a percentage of disease. Rhizoctonia was unusually severe on the peat and muck soils and there has also been some blackleg.

—WM. STUART.

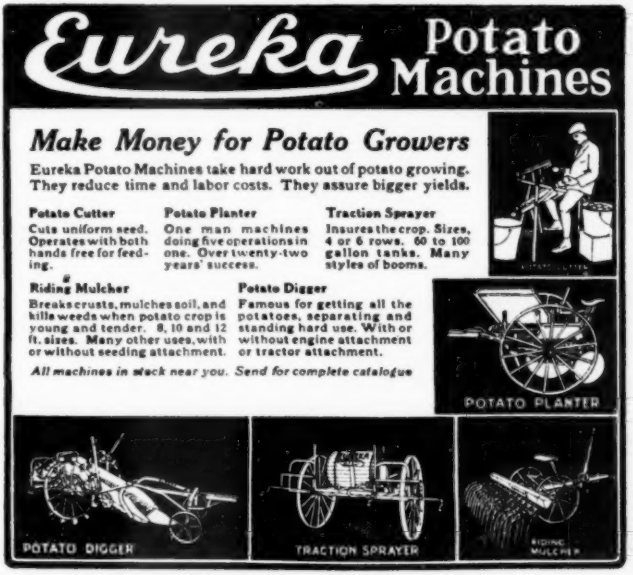
NORTH DAKOTA

The Soo Line Potato Tour Special

The Soo Line Railway through its Agricultural Department have, in cooperation with the Albert Miller and Company of Chicago, Illinois, undertaken a large seed potato development project in territory contiguous to the railway in North Dakota and Minnesota. So far as we are aware it is the largest project of its kind ever undertaken by any railroad thus far. It has involved a large amount of propaganda work in order to interest farmers to plant a reasonable potato acreage and in addition it has placed upon the railroad representatives the responsibility of finding and supplying the growers with suitable foundation stock of the varieties desired as well as a prospective market outlet for the crop produced. The Albert Mil-

ler and Company have cooperated in furnishing the seed and have entered into a contractual agreement for the purchase of seed stock that passes certification. The grower receives a basic price per bushel at time of delivery of his stock. To this the Albert Miller and Company add a fixed charge for the storing, handling and marketing of the crop. All receipts in excess of these two fixed charges are to be divided equally between the grower and the company. The project also involves an obligation on the part of the Soo Line and the Albert Miller and Company to provide suitable trackside potato warehouses in which the crop can be stored and handled. Six new warehouses are being erected this season. That at Anamoose, N. D. has an outside dimension of 53x104.6 feet with a capacity of 55 carloads in the basement, when stored eight feet in depth, and 25 carloads on the floor above. The wall construction is of hollow tile covered with waterproof cement on the outside below ground. The bins have a floor dimension of 8x12 feet and are provided with ventilated side and end walls and an inverted V-shaped trough extending lengthwise of the center of the floor of the bin to provide further aeration. Ample provision for ventilation of the buiding is included in the structure.

With this picture of the Soo Line potato development work it will now be possible to present a brief outline of the potato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tour itself which is the primary motive for writing this article. On Tuesday afternoon, August 7th, there arrived at Minneapolis, from Chicago, two special pullman cars containing a group of some twenty representatives of potato interests from several states. This group headed by F. R. Newman, vice-president of the Soo Line, and E. P. Miller of the Albert Miller and Company represented the vanguard of a larger group, the members of which had travelled varying distances in order to join the special at Minneapolis or other points along the way. A brief automobile sightseeing trip through the city's numerous recreation parks followed by a banquet at the Minneapolis Athletic Club afforded relaxation to those on the tour prior to their departure for Leal, N. D. which was the first scheduled stop for the inspection of potato fields. Here the party was met by local business men and growers who furnished transportation to the four farms visited during the forenoon of August 8. On the completion of the morning's inspection trip those accompanying the tour boarded the train and during the lunch hour proceeded to Carrington which was the next point to be visited. Here similar accommodations were found awaiting the party as at Leal and in this case five farms were visited during the afternoon. The Irish Cobbler seemed to be the favorite variety grown in both districts visited during the day. Some excellent seed of this variety was observed on the Nicholson Bros. farm near Carrington. Over 1,000 acres are being grown around Carrington this season and it is hoped to increase this acreage to 5,000 or more as the possibilities in seed potato production become more generally appreciated.

A potato warehouse of the same dimensions as that of the one mentioned at Anamoose was under construction. This house is being built by the Carrington Warehouse Company and is especially intended for the storing and handling of seed potatoes. The days tour was completed by an open air evening session held in the park at which those on the tour were tendered an address of welcome by one of Carrington's leading citizens. This was followed by several short talks by visiting members and a few musical selections rendered by an impromptu quartet composed of members of the party. The meeting was ably presided over by E. F. Johnson, general agricultural agent of the Soo Line. During the night the special train with its occupants was moved to Harvey where in the morning the party found automobiles awaiting them in which they were taken to the scheduled farms where opportunity was given to observe the character of the Irish Cobbler, Triumph and Early Ohio strains of seed being grown in that section.

A 75 car capacity warehouse was under construction at Harvey. During the noon hour the train proceeded to Minot where

on arrival the party was escorted by Minot Chamber of Commerce members on an inspection of potato fields in the vicinity of Burlington. The principal feature of interest to most of the party during the afternoon were six plots of potatoes being grown by the Burlington Warehouse Company. These plots embraced Minnesota State Certified Irish Cobbler, North Dakota state certified Early Ohio and Triumph, common Triumph and Early Ohio and Green Mountain table stock. The latter proved of considerable interest on account of varietal mixtures and diseased plants. The stock was said to have come from the Province of Manitoba. It furnished an excellent object lesson of the folly of planting seed stock of unknown origin. This plot of potatoes was not only worthless as a source of seed stock but was a menace, serving as a source of disease contamination to adjoining seed plots.

While the party slept the special train proceeded from Minot to Anamoose where the next morning opportunity was afforded those on the trip to inspect Triumph and Irish Cobbler potato fields. The special feature of the day's trip was an inspection of some 325 acres of potatoes on the Moorhead farms some six miles from Anamoose. This acreage was largely composed of the Triumph variety. One of the interesting phases of the work on this place were the extensive experimental plots devoted to fertilizer and seed disinfection studies.

The Armour Fertilizer Works through its field representatives and the Agricultural Agent of the Soo Line are actively cooperating in the fertilizer tests while representatives of the Semesan Bell and Dip Dust compounds are also cooperating with the Soo Line agents in the seed disinfection work.

As the writer was obliged to leave the potato tour at Anamoose no attempt will be made to describe the remainder of it.

Impressions of the Tour

Our impressions of the tour and the seed potato development project as a whole, aside from those already mentioned may be briefly summarized as follows:

1. One is impressed with the size of the undertaking and the cooperative efforts of the Agricultural Department of the Soo Line to assist the growers in making a right start.
2. The extent of the financial investment of the Albert Miller and Company in the project.
3. The necessity in next season's work to use only the highest class seed obtainable; a considerable acreage being grown this season will have to be discarded, but some lots are sufficiently good to serve as foundation stock.
4. The future success of the enterprise is largely dependent on the ability of those in charge of the work to develop growers of foundation seed stock and on the strict business integrity of the producers and sellers of the stock.

5. It is impossible to refrain from certain comments regarding the smoothness and freedom from annoyance of any kind with which the whole tour was conducted. Every facility was provided those attending the tour to see everything that it was possible to see, in the time allotted, of the seed potato development project. There were no delays and always enough automobiles available to comfortably accommodate every member of the party. In fact, everything possible was done to make the tour both pleasant and profitable to all concerned throughout the whole trip. Great credit is due the Soo Line and especially to E. F. Johnson and his co-workers for the excellent manner in which every detail of the tour was handled.

—WM. STUART.

NEBRASKA

The annual potato tour in western Nebraska held August 13th to 16th was very well attended by visitors from outside the state and by the local potato growers. The principal items of interest were certification fields, experimental plots of the various departments of the Agricultural College and the increase seed plots from tuber index potatoes. The latter are some 25 in number, conducted in cooperation with the Nebraska Certified Potato Growers Cooperative and the College of Agriculture.

Three types of machines for planting potatoes by the tuber unit method were demonstrated throughout the tour,—the Iron Age, a Baker Automatic and the Keystone with a special attachment developed by two western Nebraska potato growers. While all of these machines can be worked satisfactorily it was generally agreed that the latter machine developed by Messrs. Kutchara and Hoffman of Hay Springs, Nebraska, was easily the most practical and most efficient machine observed. With this machine the potatoes are cut and planted in four hill units and the cutting edges are disinfected after each tuber has been cut. This latter precaution eliminates the objection to automatic cutting machines now on the market, as without such a precaution spindle-tuber and possibly mosaic and the fungous diseases are likely to be spread. The two growers who have invented this contrivance are planning to have it patented and then manufactured for distribution. It will undoubtedly serve a very important place in seed potato production work. They will probably adapt the same device to the Iron Age planter.

Crop conditions during the early portion of the growing season were quite satisfactory with the exception that excessive rains at planting time were apparently responsible for very poor stands. During the latter part of July the dry and hot

weather which has continued almost unbroken for four weeks did considerable damage to the rather large vine growth that was produced by the earlier conditions. At this date the prospects are that the late crop, especially in the dry land regions, will ripen several weeks earlier than normal. It also seems very probable that the yield will not be much more than 50 or 60% of what was in prospect about the middle of July.

The early plantings (April and May) were practically all killed off by early blight during the third week in June. Digging has been delayed in these early fields due to unsatisfactory prices. Many of them will either remain undug or will be put onto the market in competition with late potatoes.

—H. O. WERNER.

Review of Recent Literature

Factors Affecting Returns from Potatoes in Massachusetts

Mighell, Ronald L., Massachusetts Agricultural Experiment Station, Bulletin 240.

Potato production as an economic part of the farming scheme in Massachusetts was studied by using information obtained from 54 farms in four different areas in 1926. Personal visits were made to 13 or 14 farms each in Chesterfield, Granby, Concord, and Seebouk districts. Soil type, rotation, fertilizer, seed, labor distribution, varieties, spraying, and the like were studied in their relation to yield, cost of production per acre and cost of production per bushel.

Massachusetts produces only two to three million bushels annually, or about one-tenth its consumption requirements. The author raises the question whether farmers in the areas adapted to this crop could not afford to increase production. Potato farm prices in this state have averaged 50 to 67 cents a bushel higher than farm prices in Maine during the years 1921 to 1926, largely because of differences in frieght and handling charges. Data are presented to show that man labor on these farms ranged from 54 to 216 hours per acre. Rate of seeding varied from nine to 20 bushels and manure from none to 30 tons per acre. Yields varied from 70 to 388 bushels in 1926. The use of special potato machinery reduced the man labor requirement in planting from 17.9 to 7.5 hours and in harvesting from 66.3 to 42.6 hours per acre. In general, the cost of producing an acre of Cobblers was as high as that of Green Mountains. Since the yield of the latter was consistently higher, returns per acre were in favor of the Green Mountains. The

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author concludes that the practice of greater efficiencies in the use of labor, seed, fertilizer and all other factors affecting yield would result in increased profits for those favorably situated for potato production.

—E. V. HARDENBURG.

Salaman, Dr. R. N.—A note on the Production of Premature Sprouting in the Potato, and its Application to the Study of Virus Diseases. Journ. Agr. Sci. 17:524-529, Oct. 1927.

The author treated seed in solutions of sodium and potassium thiocyanate and thiourea. The varieties Great Scot and President were used in the first experiment and King Edward and Arran Chief in the second trial, while in a third test all but Great Scot were treated. Differences in varietal response to the treatment were noted. It was found that the chemical stimulants used did aid in abridging or abolishing the resting period especially when cores of the potato tubers were treated. The thiourea treatment resulted in the devlopment of more sprouts from a single eye than from the thiocyanate treated seed.

—WM. STUART.

Salaman, Dr. R. M.—Abnormal Segregation in Families Arising from the Cross Solanum utile x Solanum tuberosum. Sonderabruck aus den Verhandlunger des V. Internationalen Kongresses fur Vererbunwissenschaft. Berlin 1927 p. 1230-1239.

The progeny of several crosses of Solanum utile crossed with domestic varieties of the potato were studied by the author for the purpose of observing the segregation of characters of the two parent plants. The F_1 seedlings in all of the crosses, no matter what the domestic parent, were perfectly uniform. On the whole the progeny bore a striking resemblance to ***S. utile.*** They differed however from ***S. utile*** in being considerably taller. They also bore seed balls freely. Some abnormal plants were noted which in outward appearance closely resembled ***S. utile*** but which were somewhat taller and bore a small crop of rounded tubers on relatively short stolons. ***S. utile*** generally does not produce tubers or at most a small white long tuber which is more like a thickened stolon than a tuber proper. These were propagated from tubers the following year and all three of the abnormal plants mutated in every character to their original F_1 sister plants. Back crosses were not effected between the original domestic parent and the F_1 seedlings but with two of F_2 ***S. utile***-like plants and one of the F_2 generation Figures 1 and 2 graphically represent the way in which individual seedling progenies segregated as to certain characters.

Cytological studies sowed 36 chromosomes in the heterotype and homotype divisions of ***S. utile*** while that of a highly bred domestic seedling used as a male parent had the haploid number of 24. In the F_1 generation the somatic number is presumed to give $2x=60$ and this number is assumed to give the typical uniform F_1 plant. At the reduction division of the F_1 24 domestic chromosomes unite with 24 ***S. utile*** chromosomes giving 24 bivalents, the other 12 ***S. utile*** chromosomes remain unpaired and segregate at random in the heterotype and homotype divisions so that the composition of the pollen grains varies from 26 to 32. On the assumption that the same type of segregation occurs in the megaspore, mating of gametes would give a variety of forms possessing 24 bivalents plus a varying number of univalents. Chance mating of gametes, it is suggested, will give two types of chromosome complex in the F_2: (1) Those containing 60 to 72, that is plants derived from gametes containing six or more univalents and (2) those containing from 48 to 60, that is derived from gametes containing less than six univalents.

—WM. STUART.

Salaman, Dr. R. N.—The Inheritance of Cropping in the Potato. Souderadruck aus den Verhaudlungen des V. Internationaleu Kongress fur Vererbungivissenschaft Berlin 1927 p. 1240-1253.

According to the author the investigations were begun in 1911 and deal with some 25,000 seedling potatoes embraced in over 400 families. The following system was adopted as a means of more accurate measurement of the relative cropping inheritance in different seedling families.

Crop 1 in which the proportion of the tuber mass to the above ground hauhn is very high. Such crops would be designated as very good.

Crop 2 in which the proportion is less and in which the crop would be described as fair or medium.

Crop 3 in which the proportion is still less and the crop, though not an indifferent one, is in no sense negligible would be described as poor.

Crop 4 where the proportion sinks still further and the crop, almost negligible, would be described as extremely poor.

Crop 5 where there is no tuber formation, or at most a few thickened bulbous swellings on the stolons. Such plants would be designated as zero croppers. The article contains 24 figures representing the cropping curves of many families. In a discussion of the relation of vigor to crop the author states that whilst the relation between actual crop weights and the vigor of

the plants producing them is a close one, there is no definite relation between the cropping curve of a family and the vigor of the plants which give rise to it. A high curve may be associated with a low or high vigor and a low one with a high or low vigor. On the other hand zero croppers were frequently found to be accompanied by the highest vigor.

—WM. STUART.

Dudley, Jr., John E. and C. L. Fluke, Jr. Spraying versus Dusting to Control the Potato Leafhopper in Commercial Potato Fields in Wisconsin.

Wis. Agr. Exp. Station. Res. Bul. 82 Feb. 1928.

The experiments reported in this bulletin extended over a period of four years—1922 to 1925—and were conducted at Waupaca and Spooner, Wis. A triple pump traction sprayer covering four rows with three nozzles to the row was used to apply the liquid Bordeaux sprays at both points. An engine driven four-row duster was used at Spooner and a four row traction duster at Waupaca, each machine being equipped with two nozzles to the row. Five varieties were included in the test viz. Triumph, Green Mountain and Early Ohio one year, King three years and Rural New Yorker four years. The formula used in making the liquid Bordeaux mixture was four pounds copper sulphate; five pounds hydrated lime and 50 gallons of water. The copper-lime dust contained either 20 or 25 per cent monohydrated copper sulphate according to whether or not an arsenical was used. A definite increase in the percentage of No. 1 potatoes was secured both by spraying and dusting. The average increase of No. 1 potatoes in the treated plots was 6.1 per cent greater than in the check plots, which equals 8.4 bushels per acre. The average increases for spraying and dusting combined varied from 22.7 bushels per acre in the two years of little hopperburn to 59.3 bushels per acre in the two years of heavy hopperburn.

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—WM. STUART.

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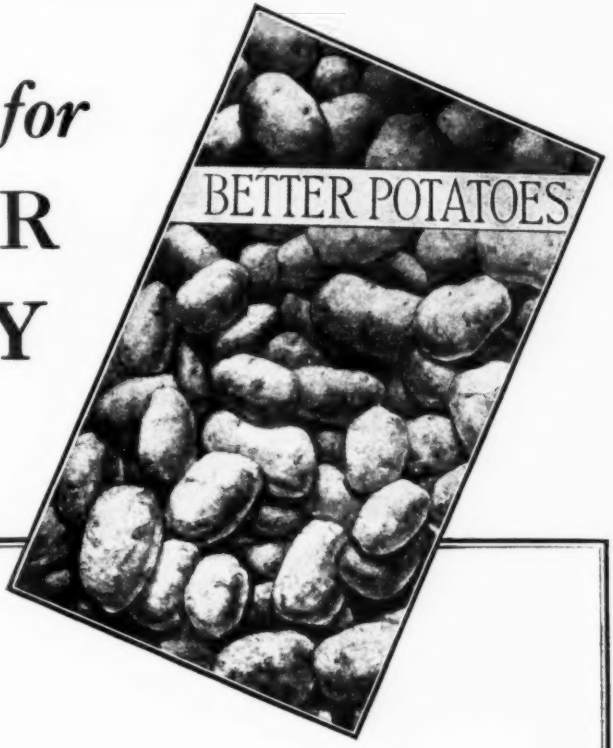

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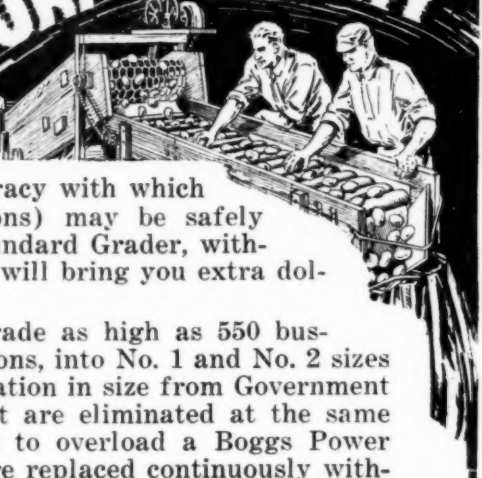

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Alcott's "Potato Gospel"

JOHN HARVEY KELLOGG, M.D., L.L.D., F.A.C.S., Medical Director, Battle Creek Sanitarium

When Carlyle, the famous English essayist, ridiculed Bronson Alcott's "domned potato gospel," he helped to block the wheels of a dietetic progress which would have meant far more for England's prosperity than the discovery of gold in the Transvaal or the founding of a new colony. Alcott was right. The potato has made good. It is proving itself to be one of the choicest of all America's gifts to the world. If corn is king of cereals, the potato is certainly queen of vegetables; and there is good reason for believing that the country would be much better off, economically as well as from the standpoint of health, if this wonderful tuber one of Nature's most amazingly efficient devices for capturing and storing solar energy, occupied a much more conspicuous place in our American dietaries.

For some unaccountable reason, the potato has always been opposed by absurd and wholly baseless prejudices. When first introduced into Europe, the potato met great opposition. It was even accused of being the cause of leprosy, which was then more or less prevalent in various European countries. In more recent years, the potato has been charged with being the cause of indigestion and rheumatism. All of these accusations are equally unfounded.

The idea that root vegetables, particularly roots such as the potato, are inferior foodstuffs and indigestible, is a serious error which somehow has attained wide currency. The fact is that root starches when cooked are by far the most easily digestible of all footstuffs.

Some years ago, Professor Grierson, an eminent German physiologist, made a careful study of the digestibility of starches from various sources. He found that the starch of rice, wheat and corn requires two hours for digestion; the starch of oat-

meal, eighty minutes; while arrowroot digests in thirty minutes, and potato starch is completely digested in ten minutes. In other words, the starch of wheat, corn and rice requires twelve times as long for digestion as does the starch of potatoes; and the starch of oatmeal, eight times as long.

No doubt the substitution of cereal breakfast foods for the old-time griddle cakes, fried potatoes, fried pork and other indigestibles, has been in the interest of the conservation of the American stomach, but there is much reason to believe that the Irish potato, steamed or baked, might well fill a larger place in the national bill of fare, especially as a breakfast food.

A baked potato digests in much less than half the time required for the digestion of a slice of bread and affords nutritive substances in some respects superior to those provided by wheat.

The above mentioned results were fully confirmed by tests made in the laboratory of the Battle Creek Sanitarium by an expert German chemist. So it appears that the potato, far from being hard of digestion, is one of the most easily digestible of all foods. If it seems at any time to disagree, the cause will generally be found in the mode of cooking or in indigestible combinations. Frying greatly lessens the digestibility of the potato; but on the whole, it is less easily spoiled by ignorant or careless cooks than are most other foodstuffs.

When Sir Walter Raleigh sent his first cargo of potatoes to England nearly 350 years ago (1586), Europe was frequently suffering from the great and frequent prevalence of scurvy. After the potato had come into general use, this great scourge of the Middle Ages almost disappeared.

The housewife adds potatoes to her bread sponge because it encourages the growth of the yeast plant and so makes the bread rise better The growth-promoting vitamin B which the potato supplies in great abundance is as active in encouraging growth of the children as in helping bread to rise. It is equally useful to adults in maintaining good nutrition and in promoting the repair of the tissues.

A research undertaken by Ross and Cooper of Columbia University, showed the potato to posses a high nutritive value, and fully capable of meeting the protein requirements of the body when taken in the quantity of about three pounds daily by a person weighing one hundred and ten pounds. The only other article of food eaten were butter and sugar, the latter in very small quantities.

The observations of Ross and Cooper have been recently confirmed by studies of Kon and Klein, of Warsaw, Poland, whose subjects, two adults, lived for five and a half months on a diet of potatoes, with fat, and a small allowance of fruits. The subjects remained in excellent health, with good digestion and every evidence of good nutrition.

Dr. Hindhede, the eminent Danish physiologist, observed a

subject, the Danish athlete, Frederick Madsen, while on an exexclusive diet of potato and margarine during eleven months. He remained in excellent health and suffered no serious inconvenience from his diet. Of course, its monotony was not altogether pleasant; but, as Dr. Hindhede says, "Madsen is a hero," and one result of his experiment was to convince the Danish people of the high value of the potato as a foodstuff and to induce them to eat it themselves instead of feeding it to pigs and eating it at second hand. The result was a most notable improvement in the mortality rate. The death rate during the period of rationing at the time of the World War, fell more than one-third, reaching the low level of 10.4 per thousand, the lowest death rate ever attained in any country.

As a transformer of sunlight into human food, the potato stands high in the list of food plants. An acre of ground planted to potatoes may be made to produce two or three times as much nutrient material as is ordinarily produced by oats, barley or wheat. Under some circumstances, it may even yield a larger return than corn, its only rival among foodstuffs generally cultivated in this country.

The chief defect of the potato as a complete nutrient, is its lack of lime. It is also deficient in vitamin A. Both these defects are supplied by dairy products. The Irish combination of potatoes and buttermilk is almost ideal. With the addition of greens, nothing is lacking, and on such a diet a man would be as healthly and enduring as his forest relatives, the gorilla and the chimpanzee. Old Parr, who lies buried in Westminster Abbey, lived on this simple fare, with rye bread, for more than a century and a half. His tablet reads, "Here lies Old Parr, who died at the age of 152 years and nine months."

More potatoes, greens and milk, and less meat and cereals, is the diet formula which up-to-date scientific research in nutrition laboratories prescribes for Americans who wish to live long and well.

Editor's Note—This is the second of a series of articles by Doctor Kellogg. The next article will appear in an early issue of the American Potato Journal.

Potato Blight

DONALD REDDICK, Cornell University, Ithaca, N. Y.

Just 80 years ago Chauncey Goodrich published an article on potato blight in which he states that "the immediate cause of the potato disease is sudden and extreme alterations in weather occurring at critical periods in the growth of the plant." This conclusion is based on the observations made largely in 1846 at

Utica, New York. The temperature records which Goodrich published show some extreme fluctuations in temperature in June and July, and the records in the Patent Office reports as well as the agricultural press of the time attest the extent and destructiveness of the blight in that year.

Goodrich denied the causal relationship of the "mildew" which he saw on the foliage but this was the popular belief at the time and only three scientists, Payen, Morren and Berkeley, upheld the fungal origin of the disease, and this to the detriment of their scientific reputation not to mention the grave doubts held by some of their colleagues as to their sanity.

When DeBarry finally settled it in 1861 that **Phytophthera infestans** is the cause of the potato blight the speculations of the previous 20 years were largely disregarded by the new generation of cryptogamists and this with decided detriment to themselves as well as to the producers of crops. The records of conditions that are favorable to the appearance of potato blight are just as useful today as they were in 1848. Goodrich thought of these fluctuations in temperature as affecting the physiology of the potato. Our present idea is that the effect is primarily on the parasite but when the truth is finally known it may well be that both are involved.

The idea that fungi develop best in a hot and moist place finally permitted the idea to develop almost universally that "hot, muggy" weather is needed to bring on an attack of blight. It is not surprising that growers should have come to such a conclusion because they could not be expected to make allowances for an incubation period of the fungus in the potato tissue of from four to six days, but that the scientist should have allowed this idea to persist and thrive for over 50 years is at least a record of one of the things that in his estimation did not come within his purview. When Melhus finally found the secret it then appeared that the problem was one preeminently for the scientist. Goodrich's idea about the incidence of blight becomes intelligible when Melhus shows that a chilling of the "spores" is necessary to bring about their germination. How DeBary should have been able to study spore germination and show the penetration of the germ-tube of the swarmspore through the cuticle of the leaf is readily explained by the fact that Freiburg i/Br. where he worked, as well as in most parts of Europe, the summer temperature is much lower than in the United States, that the first killing frost is much later in the season than in the northern U. S. A. and that the potatoes are grown late in the summer in that region.

There have been numerous attempts to show the relation of rainfall to development and spread of blight and the correlation is usually very good. It seems to the writer, however, that the study should now be extended to include temperature relations

and, if possible, humidity, wind velocity and dew formation. It is unlikely that the existing records of weather are sufficiently detailed to give the minutiae necessary for the complete analysis of the situation but rainfall and temperature records alone would probably give a more complete explanation of the conditions affecting the incidence of the disease than now exists. One usually expects that following a rain the temperature will drop. In a season when this doesn't happen or when the drop in temperature is relatively small it is possible to have more than the average precipitation with little blight. On the other hand it is possible, as has happened the current season in central New York, to have a very pronounced spread of the blight in the foliage with no measurable precipitation at all. Cool nights with heavy dew have given this result. The relation of telluric conditions to the over-summering of Phytophthora infestans is not as clear as it should be despite much speculation and some experimentation on the subject.

The temperature most favorable for the germination of the spore (sporangia) of the blight fungus is about 50° F. Germination can be secured both above and below 50° but a temperature of 60° is too high for results in the field. In 1927, for example, the thermometer at a certain time in September stood almost exactly at 60° for a period of 48 hours with mist and fog sufficient to keep the foliage dripping wet. Blight was already abundant on a very susceptible variety in the field. Conditions seemed very favorable for heavy infection but the spread of blight was too slight to make possible the following week a set of records on the resistance of some "blight-proof" varieties and hybrids that were growing there.

The swarm-spore germinates and its tube penetrates best at about 70°F., but infections can be got at considerably lower temperatures. A longer time is required for this phenomenon to occur at the lower temperatures, but when it is recalled that at 50° some sporangia will have germinated within 30 minutes and that a very high percentage of them will have germinated within three hours, that swarming only lasts a few minutes when the temperature is raised to 70°, that at 70° the swarmspore germinates very promptly and that within two hours (often in much less time) the young developing plant is sufficiently established within the tissues of the host so that it is no longer dependent upon external conditions, it is easy to believe that neither the factor of temperature nor of time for swarmspore germination could have been operative in the case mentioned The temperature of 60° was not low enough to initiate germination of the sporangia. This was confirmed by testing fresh sporangia in shallow drops of water. No swarmspores were produced and only a few cases of direct germination by a tube were observed.

The close relation between the optimum condition for the de-

velopment of the fungus and the conditions that usually exist on almost any autumn night in the northern states—chilly at night with heavy dew persisting until 8 or 9 o'clock with slowly rising temperature—is one for more than casual mention as a case of adaptation. It can be cited as a very strong argument in support of the idea that this host and this parasite have been associated for countless generations. On the other hand, some reasons for thinking that this association is a relatively modern one have been presented by the writer in a recent issue of Phytopathology. In the latter case we must still look to some cool-temperate or sub-boreal solanaceous plant as the original host of the fungus. The physiology of the fungus demands it.

It is well known, of course, that high soil moisture is necessary for infection of tubers. The fungus practically never runs down the stem to the tubers so that the amount of tuber rot that develops is dependent upon the ease with which the swarmspores can get from the surface of the ground to the new tubers. The character of the soil and in particular its waterholding capacity is an important factor. It not infrequently happens that the tubers show extensive rot when the amount of foliage injury is almost negligible or indeed may have been so slight as not to have been seen at all. On the contrary the foliage may be completely destroyed with practically no tuber rot and, in case of very late outbreak, with very slight reduction in yield. In rare instances, as for example in 1846, the outbreak may come so early in the season that there is no crop at all. "It depends upon the weather."

Some Observations on Late Blight Development in 1928

DANIEL DEAN, Nichols, N. Y.

Losses by late blight and rot have badly damaged the late main crop of potatoes from Maine through to Minnesota since September 1. At that date there was a general infection of the vines over all this area which produces three-fourths of our fall, winter and spring supply of potatoes excepting in the southern peninsula of Michigan. As yet the infection was not heavy enough to reduce the expected yield very much excepting for the Green Mountains on Long Island. Hot and dry weather for two weeks would have cleaned up most of the disease on the vines and left the crop to ripen clean.

That is just what happened in September, 1927. Last season

blight got a big start over most of the area it covers this year. Rainfall was very heavy the last half of July and the whole of August. Considerable losses did occur, both from loss of foliage and from tuber rot, particularly in Maine. Suddenly about September 2 the weather turned dry and hot. Without more rains to keep the germs multiplying on the vines the blight began to disappear from the vines, and by October 1 it was hard to find. Without big rains to wash the germs down into the soil few more tubers were infected. A large part of those infected earlier so rotted away in the soil that growers were able to detect them at harvest and throw them away in the field. The crop stored had less infection in the bins than had been the case with the 1926 crop. That one had a very light vine infection, but it came late, just before digging, and storage losses were often very heavy.

This year blight started in the fields earlier than in 1927, aided by a heavy infection of the seed used, and by the record rainfall of June. However the rainfall of late July and of August was in most cases less than for the same time in 1927. The blight on the vines made slower progress than in 1927. The big difference up to September 1 was that there were but few heavy pouring rains to fill the soil with water and wash the germs off the foliage down to the tubers.

Since September 1 conditions for blight and the resulting rot have been exactly opposite those of 1927. Instead of bright and sunny weather with winds to keep the foliage dry, rainfall has been quite heavy and much of the time there have been the kind of lowery, cloudy days under which blight spreads easily. Particularly in the states of Wisconsin and Minnesota and in the northern peninsula of Michigan rains have been at times almost torrential By the middle of the month it was apparent that one of the worst blight attacks ever known had hit this section east of the Red River Valley. Hundreds of cars arrived in Chicago and other terminal markets badly infected with rot, just as happened with Maine and New Brunskick stock in August, 1927. The daily reports for the last few days tell us that in some sections digging had to stop till the soil dried out. That is just the condition under which blight spreads fastest among the tubers. Further east in New York, Pennsylvania, and with the late crop of central and northern New Jersey, the blight infection which had been in most cases rather light on the foliage began to progress faster. Reports of rot losses are coming oftener. It is safe to say that there are but very few fields in these three states that are not either dead, or so damaged that the hope of further growth is gone, unless they have been carefully sprayed.

The blight epidemic of 1928 has given us an acid test of potato

spraying. It has been so severe that only the best growers have fields left on September 20 in those states in a condition where they can make further growth of vines and tubers. Where growers have sprayed ten to twelve times, have given care to the arrangement of their spray nozzles, have used powerful sprayers and taken care to make good spray material, they have been able to keep their vines green and growing. Some of the very best spraying has been done by growers who produce certified seed potatoes. The experience of the last two seasons has shown that clean seed is a big help toward producing a clean crop.

How will this epidemic of disease and loss affect the size of the 1928 crop and the prices growers will get for it? Up to September 1 the big acreage planted together with the heavy rainfall of the early summer entirely justified the crop estimates put out by the Department of Agriculture. Study of the crop estimates, of potato prices at shipping and receiving points, and of records of carloads shipped each season shows clearly that potato crops are usually largest and prices lowest in the cool and wet seasons like 1928 has been in so many eastern sections. Of course our population is increasing every year by about one and one-third per cent, and we have to have from five to six millions of bushels every year more than the year before to give every consumer his or her supply of baked, boiled, mashed or chipped potatoes. But the jump from 407 million bushels in 1927 to the 467 millions of the September 1 estimate looked as if the potato growers had bit off a lot more than the consumers could ever chew. Part of this big potato crop was due to the immense yields harvested in the early crop sections, yields so great that potatoes were sold at the lowest prices for many years, and which meant very heavy losses to the growers and shippers.

It is too early yet to forecast what will be the result of this year's epidemic of late blight and rot upon the crop and prices. What we know on September 20 is that outside of Michigan practically all of the great main crop area east of the Red River Valley is hit very hard. These sections have very nearly escaped in recent years, and may escape damage yet should weather turn dry. Ontario and southern Michigan have much less blight up to date than the other big producing sections. But it is a sure thing that nearly all the potato vines over an immense area are too much damaged to make the further growth between now and the time of killing frosts that the crop must always have to get really large yields.

The question of rot losses is even harder to answer. It is sure that there will be much less in storage. We know from many years of experience with blight rot that when the infection of the tubers in the soil takes place around or after the middle of September it is too late for all the damage to be discov-

ered at digging. Particularly if the soil is muddy, it may take weeks to dry out and even then the disease often develops so slowly that the spots on the tubers hardly show at all. But they do in the warehouse.

Just how many millions of bushels of further growth will be lost to the crop, how many bushels of rot thrown away in the field, and how much rot will be carried unseen into storage cannot be guessed yet with any degree of certainty. All we know is that the 1928 blight and rot attack covers about the same area as the previous great epidemics of 1925, 1915, 1903 and 1885 and that it is already very severe.

We must remember that the crop estimate men have a very hard and difficult job in years like this. Study of their monthly reports of condition of the potato crop for 25 years back tells that it generally shows up quite well in the early reports for July 1 and August 1. That is what we would expect, for blight and wet seasons go together. Up to the point where blight is really bad, the wet weather grows the crop faster and better than in dry seasons and it is really in good shape. Bad blight seasons generally show percentage conditions of 87 up to even 92 at these dates. Later when the disease first kills down the vines and then rots a part of the potatoes, the crop reporters cut down their forecasts. We will have to wait till the whole crop is dug. By the time of the December final estimate we will know how our potato supplies compare with other seasons. One thing is sure. No consumer or dealer likes a rotten potato. A lot of men are going to be very anxious to sell their potato troubles during the next two months. Later, good stock should sell well, for then it will be safe.

It is too much to expect that the crop will be cut down to the size of the 1925 or 1926 crops. It may yet be larger than in 1927. With the immense production in both the southern early crop states and in the intermediate states which are now selling, and which do not appear to any extent in the carlot records, a crop of 440 million bushels will give but few more main crop potatoes for winter and spring use than the 407 million bushel crop of 1927, when we also remember how the increased population also needs between 5 and 6 million bushels additional to the 1927 demand. What prices will be after the market steadies down will depend largely upon the keeping qualities of the potatoes in storage, whether good or bad, for although the crop reporter is compelled by law to record the harvest of a potato which later rots in storage, no law can make a consumer eat it.

Some Pointers on Potato Storage

R. C. WRIGHT, Bureau of Plant Industry, United States Department of Agriculture

The proper storage of potatoes is a most pertinent subject at this season of the year to those interested in handling this crop. Much has been written on the subject of the storage of potatoes but it is felt that some repetition will not be amiss at this time.

Curing: Potatoes destined for storage before they find their way to the consuming market should ordinarily be well matured and handled with more care than those destined for immediate consumption. Such stock is less subject to mechanical injury in handling and ordinarily will show less shrinkage in storage. On the other hand immature potatoes are much more subject to being skinned and bruised in digging and subsequent handling. Such stock is less attractive due to the "feathered" appearance caused by the adhering pieces of loose skin and if the initial storage temperature is too low to favor complete healing over of the skinned areas greater shrinkage due to the entrance of decay organisms and the loss of water at these areas will be noted.

Some recent evidence seems to show that potatoes which are immature due to late planting or an unavoidable short growing season because of early frosts can be fitted for storage by "curing"or subjecting them to a temperature sufficiently high to allow the bruised and skinned areas which will invariably be found to a greater extent in immature stock to heal over or suberize Evidence presented by investigators in this country and abroad show that healing over of wounded areas on potatoes progresses very very slowly at 50° F. and below this temperature very little healing takes place, while between 60° and 70° with a high humidity rapid healing takes place.

A practical application of this information would be to insure a sufficiently warm temperature with the absence of sunlight to potatoes immediately after being dug to hasten the healing over process. Mature potatoes will be benefited by such treatment since with these a certain amount of wounding will invariably be found. The proper condition for this would seem to be a temperature between 60° and 65°F. with a relatively high humidity for about three weeks.

Storage Temperature: There seems to be present among some handlers a notion that the temperature of potatoes should be gotten down to 38° to 40° as soon as possible after putting them into the storage house. This theory is possibly due to the fact that this is the usual custom with the storage of fruits. In this case this is desirable in order to delay complete maturity as well as prevent decay. In the case of potatoes decay ordinarily develops at a higher temperature than in most fruits and the principal object in keeping the storage temperature low is to delay

sprouting. Sprouting in potatoes will not occur until a certain dormant period has been passed through. While this period varies with different varieties and with the storage temperature, there is usually no danger of sprouting before 30 days at the least.

What is the desirable storage temperature for potatoes? Provided potatoes are in proper condition a temperature of 40° F. within the tubers is sufficient to prevent sprouting for at least 60 days with most varieties. A lower temperature than this should do no harm provided freezing does not take place (the average freezing point of potatoes is around 29°F.) but such a storage temperature seems not to be necessary. A temperature betwen 36° and 38° will indefinitely prevent sprouting. Seed potatoes to be held for late planting must therefore be stored at least as low as 38° after about 75 days from the time they were dug

The table quality of potatoes is at its best when they are stored at not lower than 40° since at temperatures lower than this an accumulation of sugar is noticeable and this renders them more or less unpalatable. This excess of sugar due to low temperature storage will, however, disappear in a week's time after potatoes are held at ordinary room temperature.

Humidity: The relative humidity of a potato storage should be around 85 per cent. A much lower humidity will cause withering and excess shrinkage due to loss of water. The humidity should not be much higher than this figure because of the danger of condensation, especially near the top of the building. Condensation or free water on potatoes greatly favors the development of decay.

Insulation of Storage House: The storage house should be sufficiently insulated to insure against freezing. It is equally as important to insulate the roof or ceiling of the potato storage as the side walls. When the roof is not insulated as is often the case the warm moisture-laden air rising from the mass of potatoes is chilled under certain conditions and undesirable condensation drips back on the potatoes.

Ventilation: Free air circulation around and beneath the bins insured by slat floors and double slat partitions will not only assist in carrying off the products of respiration but tend to equalize the temperature within and around the bins and prevent condensation of moisture or sweating. Where crates or bags are used for storage these should be separated by sufficient dunnage to allow air circulation.

Ventilator openings in the storage should be carefully tended so that at no time will they be opened when the outside air is warmer than the air within the storage as this will cause condensation. This warning applies to the opening of doors. Should it be necessary to open them to gain access to the storage they should not be allowed to remain open.

Experience with Seed Selection in Nova Scotia

W. K. M'CULLOCH, Kentville, N. S.

The superiority of selection by the tuber unit method over that of ordinary or mass selection is shown in the results of some seed improvement work in Nova Scotia. During the winter of 1924 a number of tubers of Green Mountain, Bliss Triumph and Irish Cobbler varieties were indexed in the greenhouse and planted in the field, the following spring, in tuber units. Practically all of these units were retained and planted as separate tuber lines. In 1925 and 1926 each one of these lines was planted, not by the unit method, but in the mass. That is, the tubers of each line were simply massed together and cut in the ordinary way some time before planting. When it became apparent that virus diseases were again making headway among the plots it was resolved to return to the unit method of cutting and planting. It should be stated that all tuber lines were planted in single row plots and were subject to careful roguing.

At the same time as the above, seed selection of potatoes was started on what is now an Illustration Station on North Mountain, Kings County, N. S. Green Mountain tubers were selected in the field in the fall of 1923 and planted in tuber units in the field in 1924. The best units were selected each fall and bulked and again planted in units the following season. Diseased or suspicious units were carefully rogued out.

At Kentville, after two seasons of handling in the mass, 13 out of 22 tuber lines had become diseased, and after a season of the unit method of handling only 6 of the 22 remained in the diseased list.

On North Mountain the original Green Mountain tubers were selected from a field showing 8 per cent diseased units. The first tuber unit plot (1924) showed 7 per cent mosaic. That of 1925 showed 3 per cent and, subsequently, no mosaic has been seen in the plot.

The benefits of tuber unit work are only realized when it is carried out with a thoroughness which includes frequent inspection and roguing.

Seed Potato Certification in Prince Edward Island

S. G. PEPPIN, Charlottetown, P. E. I.

It is becoming more and more evident to potato growers the world over that the seed to be used is the greatest factor to be

considered when making plans for a crop. This applies not only to the producer of ordinary table stock, but also and with still greater force to the seed potato grower.

The demand for good seed potatoes has increased during the past decade by leaps and bounds, and should continue. The area planted to the potato crop in the United States this year totals 3,83 2,000 acres. Certainly not all the seed used to plant this acreage is certified Allowing at least fifteen bushels of seed to plant each acre means a planting requirement of 57,630,000 bushels of seed, or eleven million bushels more than the predicted total production of all the New England states this year.

Inspection and certification systems have been inaugurated by many of the states of the United States and all the provinces of Canada. Certification officials are using every means at their disposal in an effort to produce better seed potatoes. Their aim is to provide seed stock relatively free from serious diseases. Certification is a means to that end. There is no question but that certified seed potatoes are superior in every respect, from a seed standpoint, to ordinary stock. There is no seed which can be termed perfect, or absolutely free from all diseases, but certified seed approaches as near perfection as human agencies can make it, due allowance being made for the inevitable frailty of human nature.

Large sums of money are spent annually by federal and state departments for pathological and experimental research in an endeavor to reduce to a minimum the ravages of the many diseases affecting the potato crop.

Although the acreage planted to seed potatoes in this province is large—there being 32,000 acres entered for inspection this year, when this is divided among the 4,500 growers, the average acreage is relatively small. This means that the farmer who grows a few acres of seed potatoes can give his crop better attention in every respect than the one who depends on quantity production of table stock. Sixty-five per cent of our growers cultivate less than five acres each, 25 per cent have over five and less than ten each, and the remaining 10 per cent have upwards of ten acres each. Only 1 per cent have forty acres or over. Prince Edward Island is essentially a mixed farming country; we do not specialize in any one product. Rotation of crops is a general practice. Generally speaking the land (sod) is plowed deep in the fall. Practically all of the seed used is treated with cold dip bi-chloride of mercury 1-1000 for one and one-half hours prior to cutting. Chemical fertilizers are used exclusively, most home mixed, and spread broadcast before planting. In many cases the sets are dropped by hand in drills opened up with a plow, and then covered with a horse-hoe; this assures better stands than machine planting. The drills average three feet apart, and the sets are spaced ten to twelve inches apart. The larger acreages are machine planted. As soon as the first

sprouts appear above ground, they are immediately covered with more soil; this is usually done twice. High hilling is favored, inasmuch as it assists very materially in reducing the possibility of late blight rot.

Spraying is an absolute necessity. Traction machines are used for wet bordeaux. Very few dusters are in use and, as a general rule, are not as effective in controlling either early or late blight on the foliage as the wet spray. Home-made bordeaux 4:4:40 at eighty gallons per acre is applied with a pressure of 200 to 250 pounds. The strength is increased, particularly on the variety Mountains, as the season advances. Spraying commences when the tops are ten inches high, usually July 15, and continues at intervals of ten days or two weeks until harvest.

The Green Mountain and Irish Cobbler varieties are most extensively grown. The former is usually planted from May 24 to June 1, and the Cobblers from June 1 to 10. Cobblers are dug first about September 20 to 30, and Green Mountains during October. As a general rule, killing frost does not come until November, by which time most of the crop is safely housed.

Applications for inspection may be registered up till June 15. First field inspection starts July 25, or about the time blossoms are commencing to open. The second field inspection follows in about three weeks. Growers whose fields have diseases approximating to the standard allowance, are advised to rogue immediately, the three weeks between inspections allowing ample opportunity to do this The standard for second inspection is so strict that growers must have their fields practically disease-free.

In spite of all precautions, such as seed treatment, insect control, roguing, etc., some diseases, particularly mosaic, persist. It is becoming increasingly difficult to maintain certain strains of seed at the certification requirements. Only by careful tuber unit planting in an isolated seed plot, or tuber indexing, or both, and by hill selection and roguing can any grower expect to produce a strain relatively or entirely free of virus diseases. A splendid market exists for foundation stock of that calibre.

Tuber inspection starts on October 1. Since most of the crop is sold and shipped in the fall, the tubers are usually housed temporarily in outbuildings, barns, etc. The first inspection is made on these piles or bins and if the tubers are found to be free of disease, and conform to the recognized type of the variety, the grower is allowed to grade for seed. On the other hand, if diseases exist above a certain standard allowance the crop is rejected and he can only ship for table stock. Should late blight rot be present above the 3 per cent bin allowance, that grower is not allowed to grade for seed purposes, until late fall or spring shipments. Our contention is that where late blight rot is present to that extent, more is likely to develop during the storage period, and such stock is far better in the original own-

ers' hands than in the consumers', or dealers', as the case may be.

A second tuber inspection is given while grading is in progress. Tags are issued when the grower demonstrates he is putting up a grade coming well within the standard allowances. In doubtful cases the tags are withheld until actual loading time. Further inspections are made as frequently as possible, either at the farm, warehouse, or loading point. Furthermore, when steamers are in process of loading, we give a final inspection at shipside, and reserve the right to reject any lots showing an inferior grade or not coming up to standard. The fear of this possibility acts as a deterrent and is a splendid control measure against poor grading

In the Dominion of Canada the Seed Potato Certification Service is all under one head located at the Central Experimental Farm, Ottawa, and is administered by the Division of Botany. One set of standards operates for the whole Dominion, being exactly the same for each of the nine provinces. The system was inaugurated in 1915 in the three maritime provinces, New Brunswick, Nova Scotia, and Prince Edward Island, and has gradually increased its scope to take in the whole Dominion, from the Atlantic to the Pacific.

The Province of Prince Edward Island, being more favorably situated as well as having a soil and climate particularly adapted for growing potatoes, has steadily increased its acreage under inspection, and has built up a large trade with the Atlantic seaboard states.

The fact that the certification work in this province has been successful is amply borne out by the following statement. From a single minimum carload of 600 bushels sold in 1918, shipments have steadily increased to 1,250,000 bushels for the 1927 crop. This would not have been possible but for the splendid cooperation evidenced by the members, and particularly the management of the Cooperative Potato Growers Association. It must be distinctly understood, however, that the Association and the Inspection Service have no official connection whatever with each other, except the one common aim of assisting the grower to produce and place on the market a vigorous, high-yielding, disease-free seed potato.

Crop and Market News

CROP ESTIMATE SLIGHTLY REDUCED

(Contribution from the Bureau of Agricultural Economics.)

Little change has occurred in either the crop or the market situation for potatoes. Digging was at its height during Octo-

ber and prices showed a tendency to stay at low levels, though shipments have been lighter than last fall and the October crop report was about 3,000,000 bushels below that of September. No matter what the weather conditions in important producing districts during the remainder of the harvest period, it seems quite certain that an abundance of potatoes will be available. Weak condition of markets was causing most stock to go into country storage.

The crop in northern Maine was expected to be out of the ground by mid-October. Yields of Cobblers were very irregular, but Green Mountains turned out better than expected. Some growers were harvesting as high as 150 barrels per acre. Quality of shipments from Maine this season should be excellent, because the potatoes going into storage were very carefully graded. In a season of high prices, much of the stock now being discarded would be allowed to go to market. One starch factory near Presque Isle had ground up more potatoes by the first of October than it had used by the end of January last season.

Local reports indicate that nearly 17,000 acres of seed potatoes of all varieties will be eligible for shipment under the blue certification tag of Maine this year. Purchases have been light so far, as buyers appear to be waiting for potatoes to go lower before closing contracts on seed. It is estimated that the grower must have at least 75c per barrel more for seed than for table stock to make the production of seed potatoes profitable.

Crop Changes for October

The October crop report for Maine was raised slightly to 38,046,000 bushels, which places that state well above Minnesota, with 36,900,000. The only other important increases in production estimates during September were for the Dakotas, Nebraska, Utah, Oregon and California. As a result of blight and other field troubles, the forecast in Wisconsin was reduced by 2,300,000 bushels, and that in Minnesota was cut by 350,000 bushels. Nearly 3,000,000 bushels were taken off the previous estimate for Colorado, and Pennsylvania suffered a decrease of at least 1,000,000 bushels. The October report still showed six states with estimates ranging between 31,500,000 and 38,000,000 bushels—Maine, New York, Pennsylvania, Michigan, Wisconsin and Minnesota. Slightly over 20,000,000 are expected in Idaho, 16,000,000 in Colorado, 11,000,000 in North Dakota, and around 10,000,000 each in Nebraska and Washington. Total forecast for the United States was reduced a bit to 464,000,000 bushels—still the largest crop ever produced in this country.

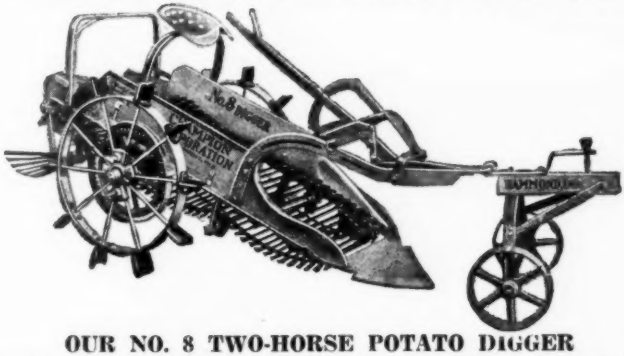
With the mid-season potatoes about cleaned up, early-October supplies were coming chiefly from Maine, Long Island, the North Central region, Colorado, Idaho and Washington. Only in four important sections—central California, Washington, Michigan and Wisconsin—were the shipment records to date running

ahead of last season's figures. All the other northern and western states, and particularly Minnesota, showed a serious lagging behind their corresponding totals for 1927. By October 6, the 19 leading states had shipped only 27,300 cars of potatoes, or 37 per cent less than a year ago, though their production probably is 8 per cent greater than in 1927. Evidently, more than the usual proportion of the crop will be carried over for the late market, and some fields may never be dug. Buying in the Corn Belt states has not been so active as last autumn, because of the larger crops within that area.

Prices at Low Level

Shipping-point prices of sacked Cobblers in northern Maine declined to 65c-70c per 100 pounds, and Green Mountains were bringing 70c-80c. Bulk stock sold about 20c lower than sacked stock. The range in North Central states was 55c-75c, while the Colorado country price was 55c-60c, but a great deal of the Colorado and other western stock was going into storage. Rurals in southern Idaho sold for cash on track at 45c, and Russet Burbanks at 65c. The Idaho f.o.b. market was slow and dull. No material change occurred in city prices of eastern potatoes, but the Chicago carlot range on northern Round Whites declined to 65c-80c.

O. K. CHAMPION POTATO DIGGER



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Notes

CANADA

Certified Seed Potatoes

The acreage entered for inspection with a view to certification was approximately 40,550 as compared with 31,601 acres last year. A total of 6,765 growers requested field inspection this season.

—J. T.

The Dominion Fruit Branch report for September shows the potato crop has not been favored generally with the best weather conditions during the past month. Prolonged dry weather in British Columbia has retarded the growth of the tubers, and wet weather has adversely affected the development of the crop in the Prairie Provinces, and in Prince Edward Island and New Brunswick favored the development of late blight In Ontario and Nova Scotia conditions have been more favorable to the production of a good clean crop. Taking the varying conditions into consideration, the crop is now forecasted at about the same or slightly under that of last year, which was finally estimated at 47,927,000 cwt.

Prince Edward Island: The area planted is estimated at 54.-000 acres, an increase of approximately 10 per cent over 1927. Plant growth has been normal, but late blight is attacking the crop and indications point to a slightly lower yield than last year.

New Brunswick: The area planted in Carleton, Victoria, and Madawaska Counties is estimated at 48,000 acres, a slight increase over 1927. Weather conditions have not been favorable, rains and warm temperatures favoring the development of late blight.

Ontario: Weather conditions in the southern counties have been variable, but mostly favorable to the development of the crop, except on low-lying lands where blight is attacking the plants. Early varieties promise a fairly heavy yield estimated at approximately 25 per cent larger than the 1927 crop. Late varieties also promise a fair yield, estimated slightly greater than last year.

—J. T.

OHIO

Production Methods of the Ohio 300 Bushel Club

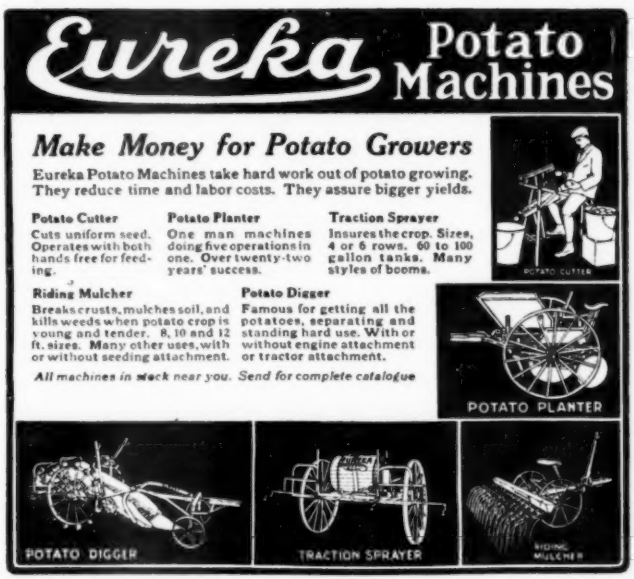
When a man makes a success of any particular endeavor, whether it be the manufacturing of some article or the growing of some product, people become interested in the methods used. If he has been a successful manufacturer or merchant for a number of years, he may have his story printed in the American

Magazine. The potato grower's story may appear in the Potato Journal and some day may be included in "who's who" in the "potato world."

I shall not give the practice of any individual but the practices of a group of thirty men representing fourteen counties of the 88 in the state of Ohio. This club has been in operation for a period of three years and this is to be the last. Next year it will be known as the 400-Bushel Club. Growers over the state insisted on this change because they felt that a 300-bushel yield could be obtained year after year and in such a case, there would be no sporting chance.

It is of special interest to know how these men are preparing their ground for the potato crop. Twenty-four preceded potatoes with a legume Sweet clover was the most popular crop seeded in grain; alfalfa was next, being used mainly by the dairy farmers. Red clover and alsike were used as well as soy beans and cow peas. Soy beans and cow peas have been used chiefly by our cobbler growers in southern Ohio, but their popularity is spreading over the entire state. Of the remaining six men, one followed potatoes, one, cabbage; one, timothy; one, wheat and two, corn.

Five men made over 400 bushels, the largest yield being 606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bushels. The average yield for the thirty men was 358 bushels. Twenty-one used manure while nine had none. The average amount of manure applied was eight loads an acre. While the average for the twenty-one men using manure was twelve loads.

Twenty-two men either applied all or part of their fertilizer in the row. The other eight broacasted it all. The largest amount used in any one case was 1600 pounds; the smallest, 300. The average amount used by all men was 883 pounds. The average analysis was 3-12-7. The men are well divided in respect to home mixing and the use of commercial mixed.

Twenty men sprayed their potatoes averaging six and one-half sprays per acre. Eight dusted, averaging five applications. There were two that did not use any foliage protection.

There is quite a variation in planting dates; four planting in April (including the two cobbler growers); eleven planted in May; while half of them planted the first part of June.

The average planting distance was 31.5 by 11.5. Twenty-eight using clean cultivating, and two, straw mulch. Twenty-three used both the cultivator and the weeder. The average of both cultivations and weeding was eight.

The average amount of seed used per acre was 17½ bushels. The largest amount was twenty-two, while the smallest was eleven. Twenty-three used the Rural Russets; five, the White Rurals; and two Cobblers.

The seed used for planting these fields was either certified or one year from certification.

Cost account records kept by these men are also of interest. When the yield per acre increases, the cost per bushel decreases. Taking the cost figures of this group of men, as a basis, it can be stated, that if a man increased his per acre yield 100 bushels, he decreased his per bushel cost approximately one-fifth.

—E. B. TUSSING.

MAINE

The prospect of an over supply of potatoes this season as indicated in the September 1st estimate has led to much speculation concerning the condition of the crop and the presence and progress of late blight infection. This has been especially true concerning Maine and it was with considerable interest in this respect that the writer studied the situation during a six day sojourn in Arrostook county, September 20 to 25. It had been known that late blight made its appearance in Arrostook county potato fields the latter part of July, but it did not cause much injury to the plants until the latter part of August. At that time poorly sprayed fields of the Green Mountain variety had gone down completely with late blight. The degree of injury

to the plants, as might naturally be expected, was directly proportional to the thoroughness with which they had been covered with Bordeaux mixture. It was also proportional to the degree of their maturity at the time of their being destroyed by late blight. For that reason the Irish Cobbler fields showed much less injury so far as reduction in yield is concerned than did the Green Mountain, and, of course, late planted fields suffered worse than early planted ones provided they were not thoroughly protected with spray material. As a rule the reduction in yield was largely due to the premature death of the plants with the consequent arrested growth of the tubers, rather than to losses from late blight tuber rot. There were, however, instances in which the percentage of tuber rot was rather high.

Acre Yields

As harvesting of the potato crop was in full blast when I was there, every opportunity was taken advantage of to learn how it was actually turning out. Owing to the fact that the Irish Cobbler fields are always harvested first, it was possible to get a more reliable slant on its acre yields than on the Green Mountain. From all the reports that came to our attention the Irish Cobbler probably averaged from 10 to 15 per cent lighter than in 1927 but the quality of the stock was generally good. In the case of the Green Mountain, however, the indications pointed rather strongly to a much greater reduction in yield. While well sprayed early planted fields were averaging 140 to 150 barrels per acre or better, there were also reports of fields yielding as low as 40 to 50 barrels from the poorly sprayed ones. This of course means that the percentage of marketable potatoes from the poorly sprayed fields will be much less than from the well sprayed high yielding ones. In other words, there is a two-fold cut—a reduction in yield and in percentage of marketable product either in undersize or in tuber rot.

The actual reduction in yield will not be accurately known until the November 1 estimate is available but there should be a fairly good indication of it forecasted in the October 1 estimate.

Of course the reader should bear in mind that Maine's 1928 potato acreage was about 10 per cent larger than last year, hence the reductions in yield mentioned do not actually have as great significance as if the same acreage basis had been maintained.

—WM. STUART.

The potato situation in Aroostook County at this time does not present a very bright outlook Table stock Irish Cobblers for the most part have netted to the grower 75c per barrel in bulk graded. In some instances a higher price has been received for a few loads to finish a car. Because of the low price for this

variety, growers have refused to sell freely, resulting to some extent in delayed digging and quite general storage. It is doubtful if the market will freely absorb the Irish Cobbler after the Green Mountain has become quite general in the markets.

Table stock prices for Green Mountain started off at from 80c to 90c per barrel graded bulk stock. The price has remained fairly steady at a dollar for two weeks; a few loads brought as high as $1.25 Saturday, dropping back to a dollar Monday.

The market for certified seed is very dull, very few orders for fall delivery having been received. Some orders have been booked for Irish Cobbler, Green Mountain and Spaulding Rose for $1.75 to $2 sacked and loaded for January delivery.

The average yield of any variety this year is not large. Some fields that were heavily fertilized and particularly those that received an application on top after the heavy May rains, and in addition received thorough spraying with bordeaux mixture, are giving large yields.

It is doubtful if more than half of the crop has been harvested to date.

—P. M. LOMBARD, Presque Isle, Maine.

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VERMONT

Approximately 1200 acres of potatoes were entered for inspection this year in Vermont—the largest acreage since the establishment of the state's certification service in 1914.

About 50 per cent of this acreage has been passed for certification, including 60 acres passed for spring delivery, only, owing to field infection of late blight. The greater part of the rejections were for leaf roll and mosaic found at first inspection—regular or supplemental.

Much more leaf-roll than usual was found; and in the case of many fields its presence in considerable percentage has been hard to account for. The disease appeared in fields whose seed stock bore very little trace of leaf-roll in its previous history and had supposedly been grown under conditions of good isolation. The fact that mosaic waited until well into the season before showing its symptoms made two "first" inspections necessary in the majority of cases. Leaf-roll was very clearly defined when the plants were eight to ten inches high, but in many fields inspected at that stage little or no mosaic could be determined. On supplementary inspection about ten days later mosaic was clearly expressed in some of these same fields. Though this condition will probably lead the Vermont Service to the establishment of a definite program of two inspections in place of the one regular first inspection. It is clear that a much more reliable leaf-roll count can be made before the plants have intermingled their foliage in the rows, but that, under Vermont conditions at least, mosaic is not likely to be showing at its maximum until that time.

Much less black leg was in evidence than was the case last year. No yellow dwarf was reported and only a small amount of spindle tuber. Late blight appeared in some quantity during the latter part of the season, but was not as serious as the weather conditions indicated that it would be. Many supplementary second inspections were made on account of the disease and it is probable that this also will become a regular practice of the Vermont Inspection Service whenever late blight appears at all prevalent.

Although the season has been naturally discouraging to those whose fields were rejected, undoubtedly much diseased stock has been weeded out which, in another year when disease conditions were more generally masked, might have gotten by. It may even be that a year of this sort at occasional intervals is essential to the betterment of potato seed stock.

—H. L. BAILEY.

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RECORD OF GOVERNMENT FIELD INSPECTION, 1928

FIELD INSPECTION OF POTATOES—NOVA SCOTIA—1928

Name and Address	Variety	Acres	Inspection No.	Black Leg %		Leaf Roll %		Mosaic %		Wilt %		Foreign %	
				Inspection 1st	2nd	Inspection 1st	2nd	Inspection 1st	2nd	Inspection 1st	2nd	Inspection 1st	2nd
Herbert	I.C.	5	7001										
Oyler, Ltd.	I.C.	6	7003										
Walter Steel	I.C.	4½	7861										
strain, R. R.	I.C.	—½	7864										
No. 1, Halls	I.C.	1	7866										
Harbor,	G.M.	5	7860			0.16		0.16					
Kings Co.,	G.M.	—½	7863										
N. S.	G.M.	2½	7865					0.3					
	G.M.	8½	7873					0.14					
	G.M.	6	7874										
	G.M.	13	7875					Seen					
	G.M.	8	7876					Seen	Seen				

IDAHO

A conference was held at Pocatello, September 17 and 18, by delegates of nine of the northwestern states to consider means of handling the 1928 potato crop advantageously.

The following recommendations were made:

First: A portion of the potato crop be fed to livestock.

Second: Only U. S. No. 1 grade, as determined by federal and state inspectors, be shipped in interstate trade.

Third: That regional committees be appointed by each of the agricultural councils or advisory boards, representing the potato industries of the several states, be formed to encourage the adoption of the above recommendation That these committees issue bulletins from time to time, giving producers a true picture of conditions and recommend procedure to be followed by growers.

Fourth: That representatives of all commercial potato producing districts of the United States shall be called together in a general meeting to be held at Chicago early in December, if possible. The date to be agreed upon and fixed by the district committee through the different advisory boards.

Fifth: That the press and all organizations and departments of government, federal, state and county, also all farmer, civic and commercial organizations of all kinds be requested and urged to take an active part in carrying out the herein mentioned recommendations.

—F. M. H.

Review of Recent Literature

Reddick, Donald—Blight-Resistant Potatoes. Phytopath. 18: 483-502. 1928.

Spraying potatoes to prevent foliage diseases represents an annual charge against production of 5 to 10 per cent of the whole cost, and even then does not always insure a sound crop. Where growers choose to risk partial or total neglect of spraying, late blight still can and does exact a severe penalty, sometimes amounting to half the crop. There is thus much more than scientific interest in continuing the quest for blight-resistant potatoes, a project that has been to a considerable extent sidetracked in this country during recent years under the influence of the current emphasis on such potato diseases as mosaic and leafroll. Reddick has taken up three of the fundamental questions underlying the practical endeavor to breed blight-resistant potatoes

and he discusses them in the light of his work as an original contributor in this field, his personal observations in Europe, where this problem is receiving much more attention than in America, and his exceptionally broad bibliographic experience.

He concludes that in Ekishirazu, a variety of Japanese origin, we possess a potato the blight resistance of which can be designated as 1, on a scale where the complete absence of resistance, as in Green Mountain, is designated by 4; and a high degree of resistance in the field, as in the variety Evergreen or Jersey Redskin, by 2. As yet, no completely resistant potato is known, though Ekishirazu develops only small lesions on very young shoots as a result of artificial inoculation. This variety is not suited to commercial culture in the northern United States. It is a good pollen parent, however, and "hybrids" with various families have yielded 46 families of plants possessing the approximate resistance of Ekishirazu, some of them decidedly tolerant to dry weather and some worthy of tests on a commercial scale "Over 2,000 new lots are to be submitted to field tests in 1928."

Certain varieties were found to suffer the loss of a few leaves very soon after inoculation, but when the first infected leaves dropped off, the disease was self limited, few or no infections occurring naturally. The great susceptibility of senescent leaves, as for instance the lower leaves which yellow from shading, was determined; also, the fact that in some varieties the foliage shows a high degree of resistance, the tubers little or none.

The low order of parasitism exhibited by **Phytophthora infestans,** its wide range of hosts, the long period of cultivation of the potato and the extensive distribution of seed potatoes and table stock are held to indicate that specialized races of **P. infestans** do not exist, or at least that any forms occurring in this country would be naturally widely distributed. In practical terms, this would mean that the breeding of blight resistant potatoes is not complicated by the existence of many local strains of the parasite, some of them differing markedly in parasitic capabilities.

An interesting historical resume indicates that potato blight was probably not known in the Andes region of South America during the period of introduction of potatoes into Europe, and it is held that the late blight fungus is not endemic to South America. This is contrary to the theory that prototypes, in which resistance to blight has naturally developed through long association with the disease, are likely to be found in the ancestral home of the potato.

—F. WEISS.

Announcement of 15th Annual Meeting

Potato Association of America

DECEMBER 27-29, 1928

NEW YORK CITY

The Potato Association of America will formulate plans at its annual meeting to bring before the consuming public the importance of the potato in the diet. It is believed that if the dietetic value of the potato was more generally understood that the per capita consumption of this valuable food article would be greatly increased. Lectures and discussions by eminent physicians and dietitians will be featured.

The storing, grading and marketing of potatoes will be discussed with particular reference to the overproduction problem of this year. Papers on these subjects will be presented by marketing specialists. A study will be made of the New York City potato markets.

The results of the most recent experiments in potato disease and insect control, seed selection problems and cultural practices will be given by scientists representing twenty states and the Dominion of Canada.

Titles and abstracts of papers to be presented at this meeting should be filed with the Secretary at once.

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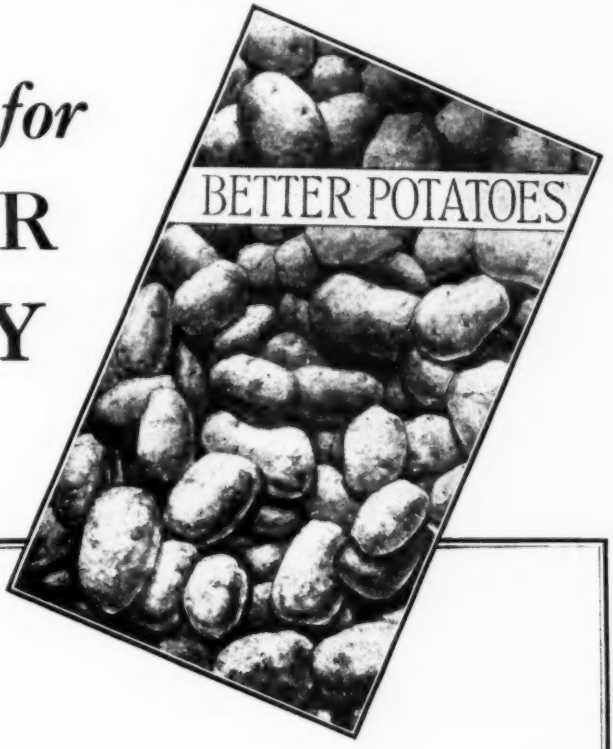

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The American Potato Might Have Won the Marathon

DR. JOHN HARVEY KELLOGG, Battle Creek Sanitarium.

Potatoes can run faster than beefsteaks. More than a year ago, Mr. Grantland Rice predicted that American runners would make a poor showing in the next Olympic in long distances. Mr. Rice's prediction was verified by recent events at Amsterdam, but his explanation was incorrect. American runners are not inferior in "human fiber." The Arab, El Ouafi, who won the Marathon, is described as a "thin, undersized youngster," with a narrow chest and spindling shanks," but he had endurance. American athletes did not lack physique; they lacked endurance. They might have won if they had eaten more potatoes and less beefsteak.

A man who can run half a mile in less than two minutes has leg, lung and heart power sufficient to carry him on several miles in record time or less. If he fails, it is not because of fault in his running mechanism. His lack of endurance in other words, is not due to lack of sturdy muscles. The explanation is to be found in one single word—acidosis. It is not lack of leg, lung or heart power that stops the long distance runner; it is the accumulation of lactic acid in his tissue fluids. To possess great endurance, one must be able to keep his blood and tissues free from acids. This ability may without doubt be somewhat improved by training, perhaps very considerably; but, after all, endurance is largely a matter of diet.

The reason for this is simple: every time a muscle contracts, lactic acid is produced and must be neutralized or removed before the muscle can contract again. The blood is made alkaline to make the quick disposal of the acid possible. How essential this is will appear when it is noted that a sprinter may produce nearly a half pint of lactic acid in one minute. All this acid must be taken care of by the body. It must be oxidized, eliminated by

the kidneys or reconverted into glycogene to be used again. Under ordinary conditions, these processes take place so rapidly that the alkalinity of the blood, an essential condition, is well maintained with a small reserve to insure safety. When acid is produced with great rapidity, as in running, the alkali reserve is soon lowered, the oxygen stored in the tissues is consumed, and acids begin to accumulate in the blood. The result is breathlessness and a slowing of muscle movements. It is for this reason that the sprinter's pace begins to lessen after the first ten or twelve seconds. The acid products accumulating in the muscles interfere with their action, and as these toxic products increase, the muscles become less and less efficient. This is true no matter how strong the muscle may be or how well trained.

The thing that stops the long distance runner is not the failure of his muscles, but the accumulation of acids. It is evident, then, that a man who has a large alkali reserve will have in running a great advantage over the man whose alkali reserve is small; that is, whose blood and tissue fluids at the beginning of his effort already contain an abnormal amount of acid.

Food is fuel. When burned in the body, food leaves residue similar in character to the ashes which are left when the food is burned in a crucible. Some foods leave an acid ash; others, an accumulation of alkaline or basic ash. Such foods as meats and eggs, when burned, leave ashes in which there is a great excess of acid phosphorus, sulphur, chlorine. In other foods, including nearly all vegetable foodstuffs, with the exception of cereals, the alkalies, potash, soda, lime and magnesia are in excess.

As a source of food alkalies, the potato heads the list of farinaceous foods. Cereals, the only rivals of the potato as sources of starch, are all acid-formers. This is true even of corn meal, the least acid of all grain products. The alkalinity of the potato is so great that one ounce of potato flour is capable of balancing, or neutralizing, four ounces of fine wheat flour and as ordinarily eaten, an ounce of potato will balance an ounce of bread.

To be able to send to the Olympic games the world's best athletes would mean much more to America than mere athletic prestige. The superior stamina and endurance which result from scientific feeding are the fundamental factors which more than any other promote physical efficiency, resistance to disease and useful longevity.

The so-called "campaign of education" which the packers are conducting to save their declining industry by inducing the American people to eat more meat, demands a counter campaign inspired solely by an interest in the public welfare, the aim of which should be to lessen the use of meat and to increase the use of the potato, together with other fresh vegetables, particularly carrots, spinach and other greens and dairy products. This is the dietetic teaching which the American people need more than any other.

Potatoes Make a Good Feed for Livestock

E. J. MAYNARD, in Charge Animal Investigations Section, Colorado Agricultural College, Fort Collins.

Potatoes make a good feed for livestock. They may be classed with stock beets and other root crops, not as roughage, but as watered concentrates. They are high in available energy for the dry matter they contain.

In Europe certain large, high yielding varieties of potatoes are actually grown for livestock but in this country ordinarily only the culls are fed. When the market price is low, however, potatoes become an economical feed for nearly all classes of livestock. As most of the expenses incident to putting them on the market do not enter into the feeding operation they can often be fed to advantage at a fairly low price.

In a year of over-production, extensive feeding operations with potatoes should have a favorable result on general market conditions.

Potato feeding experiments were first attempted by the Colorado State Experiment Station in 1923. At that time about 50,000 lambs were being fattened each year in pea fields in the San Luis Valley, a great potato producing section in the southern part of the state. The lambs fattened in this manner often suffered a heavy death loss which was shown to be due to some dietary cause.

In searching for a succulent feed to add to the standard lamb fattening ration of the region cull potatoes were used with excellent results. A ration consisting of pastured peas, alfalfa hay and cull potatoes increased the gain per lamb 3.6 pounds and decreased the feed cost $3.19 per 100 pounds gain. Feeding potatoes also reduced the death loss very noticeably.

In this series of experiments the potatoes were fed at the rate of one pound per lamb daily.

It was found advisable to pulp them through a simple root cutter which was obtained at a low cost. This method of feeding was necessary because of the extremely cold weather which caused the potatoes to freeze quickly if they were not eaten at once. The potatoes seemed to be very palatable and the lambs ate them readily.

In the fall of 1924, potatoes being very low in price, it was decided to experiment with them as a fattening feed for both cattle and lambs, in northern Colorado. A ration consisting of ground barley, 7 pounds; cull potatoes, 9 pounds; linseed cake, 1 pound, and alfalfa hay, 7 pounds, was fed to 350-pound calves for a period of 208 days. The calves gained 415 pounds or at the rate of 2 pounds per day during the fattening period. Each ton of cull potatoes fed and compared to corn silage replaced

2,119 pounds of silage, 7 pounds of barley and one pound of oil meal, but required 410 pounds more alfalfa than where corn silage was fed.

With corn silage at $8.00 per ton, barley at $1.50 per cwt., alfalfa at $16.00 per ton, and linseed meal at $50.00 per ton, the potatoes showed a value of $5.33 per ton fed to the calves.

Many cattle feeders in the Greeley district fed cull potatoes along with grain and legume hay to cattle during this period. As high as 50 pounds of potatoes daily were fed to 2-year-old steers with no ill effects. It seems safest, however, not to feed too great an amount on account of their acrid taste and tendency to increase the flow of digestive juices in the stomach and intestines. It is claimed that potatoes may safely furnish half the dry matter in the fattening ration for either cattle or sheep.

Where silo space is available and it is desired to carry over a considerable quantity of potatoes, they may be safely ensiled. They can be cut into the silo through an ordinary ensilage cutter. Two per cent, by weight, of finely ground corn meal should be added, usually through the hopper of the ensilage cutter to innoculate the potatoes with lactic acid bacteria The resulting silage is a watery mass which hardens as it drains and is very palatable. Some straw could undoubtedly be used to advantage along with potatoes and would absorb a considerable quantity of the moisture which drains away. The silage should be well drained. One feeder in the Greeley district filled a large silo with potatoes late in the feeding season of 1924 and held this silage over, feeding it with grain, cake and hay to fatten cows the next winter with excellent success.

Feeding experiments with cattle at the experiment station showed potato silage to be about equal to good corn silage. Under ordinary conditions, and if the potatoes can be fed immediately, it pays better to feed them straight to cattle rather than to ensile them.

The potatoes proved to be particularly valuable fed with grain and alfalfa to fatten lambs. Two pounds daily of potatoes fed in a ration with corn and alfalfa showed a replacement value of $8.46 per ton with corn at $1.50 per cwt. and alfalfa at $16.00 per ton.

Starch is the chief constituent of the dry matter of potatoes and there is very little crude protein present. A good protein feed such as linseed oil meal, cottonseed cake, or tankage is, therefore, necessary to properly balance any ration where many potatoes are used. If they make up only a small portion of the ration a legume hay is sufficient to furnish protein.

Raw potatoes may be fed to cattle or sheep, although cattle are least sensitive to them. If the potatoes are fed whole to cattle they should be fed in a low bunk or spread along the ground under a pole or beam. This method tends to prevent choking by keeping the animal's heads down while eating. The potatoes should be cut with a spade or root cutter for sheep.

Farmers in the Greeley district feed a great many potatoes to cows and claim that they tend to increase milk flow noticeably. Although Kellner, the German authority, states that potatoes are best not fed to pregnant stock, there is no record of trouble of this sort in Colorado. Of course, raw potatoes should be gradually introduced into the ration and if taken away this should be done by degrees.

It is usually better to cook or steam potatoes for pigs. Experiments show that about 420 pounds of cooked potatoes equal 100 pounds of corn in feeding value if fed in a properly balanced ration. Raw potatoes proved to be only 2-3 as valuable when fed to pigs. If cooked the potatoes should be salted and the water in which they are cooked should be thrown away.

For best results the cooked potatoes should not replace more than one-half of the grain ordinarily fed.

Horses are more easily affected by raw potatoes but small quantities may be fed to them also.

A poisonous material, solanine, is a regular constituent of all parts of the potato plant but exists in such minute quantity that it causes no harm. Although this poison does not increase when potatoes are stored or when they decompose, it passes in considerable quantities into the young sprouts when the potatoes germinate so the sprouts may contain a considerable amount. This means the young sprouts should not, on any account, be used in feeding.

Tuber-Shape Indices in Standard Potato Types

E. V. HARDENBURG, New York State College of Agriculture, Ithaca.

Shape in potato tubers is one of the most obvious characters by which varieties may be identified and on the basis of which standard varieties have been classified into groups or types. It is unfortunate that our descriptive terminology as used in experiment station publications and elsewhere is so little standardized that the average description of varietal type in potatoes is usually vague or meaningless. This is an illustration of the fact that mere verbal descriptions so applied have their limitations.

Although it has not been shown that variations in shape of tuber and yield within any given population of potatoes are directly correlated, numerous experimental studies have recorded the relation to tuber-shape of such factors as culinary quality, seasonal fluctuation of soil moisture, spindle-tuber disease, occurrence of hollow-heart, fertilizer ingredients, soil aeration as affected by cultivation, and soil type.

Experimental Studies

Neumann (3) in studying the relation of tuber-shape to quality in potatoes found a marked correlation between cylindrical shape and low starch content. Conversely, short flat tubers were of much higher average quality; furthermore, Neumann is in complete agreement with Schermerhorn (5) in the conclusion that nitrogen is much more important in its influence on tuber-shape than either phosphorus or potassium. Although Schermerhorn worked with sweet potatoes, he found that nitrogen tended to produce elongated roots while the influence of potash was to produce a more blocky thickened root. According to Neumann, both phosphorus and potassium are conducive to production of thick tubers. Neumann also indicated that high soil moisture content was conducive to the production of blocky tubers. The writer (1) has recently shown that our lighter soils tend to develop tubers more closely approaching the ideal type than do heavy soils. These studies included soils of both organic and inorganic origin. Krantz (2) one of the first to study the possible relation of tuber-shape to yield, concluded that "differences in tuber form do not indicate differences in productivity." He also showed that whereas distinct soil types tend to produce characteristic tuber-shape, this influence is not heriditary. Werner (7) grew Triumph variety in greenhouse pot culture on both heavy and light soils. The tubers grew more elongated in the heavier soil types. This proved to be true with respect to both healthy and spindle-tuber stock. Werner also found that tuber elongation was greater in soils of high moisture content and in soils of high temperature than otherwise. In a later paper Werner (8) found an apparent inter-relation between hollow-heart, spindle-tuber disease and tuber-shape in Russet Rural potatoes. His conclusions were based on the fact that hollow-heart occurred more frequently in the thicker and more cylindrical tubers than it did in the flattened tubers.

Methods of Measurements

Tuber-shape descriptions used by the writer in laboratory studies of potato varieties have been limited to the following seven terms: Cubical, oval-rounded, oval-flattened, oblong-rounded, oblong-flattened, elliptical-rounded, elliptical-flattened. Each of the compound terms denoting shape are so used that the first part of the term refers to the broadside view, the second term applying to the transverse shape. Where length, width and thickness approach equality, the tubers may be said to be cubical. Examples of cubical shape are Cobbler and Triumph. Most of our short tuber types are oval in broadside view and either rounded or flattened in transverse section. Examples of the oval-flattended tuber-shape are Rural and Spaulding Rose No. 4. Ohio can well be described as oval-rounded; this being the only standard varietal type of which this shape is characteristic. For

the sake of standardization, the above terms denoting tuber-shape are applied to each of the standard varietal shapes as indicted in table 1.

TABLE I.—Tuber-Shape Description of Standard Varietal Types.

Group No.	Group	Shape of Tuber
1	Cobbler	cubical
2	Triumph	cubical
3	Early Michigan	oblong-flattened
4	Rose, Section 1	elliptical-flattened
	Section 2	oval-flattened
	Section 3	oblong-flattened
5	Early Ohio	oval-rounded
6	Hebron	elliptical-flattened
7	Burbank	elliptical-rounded
8	Green Mountain	oblong-flattened
9	Rural	oval-flattened
10	Pearl	oval-flattened
11	Peachblow	oblong-rounded
12	Up-to-date	oval-flattened

These terms may be serviceable for ordinary descriptive purposes, but they are not sufficiently definite for experimental work in which shape comparisons are involved. Here definite coefficients are most convenient. Biometrical studies in which tuber-shapes have been used as one of the variables have shown that length, width and thickness are as efficient measurements of tuber-shape as relative long and short circumference taken at mid points on the tuber. Since shape of tuber is determined by the relation of length to width to thickness rather than by absolute measurements of each of the three dimensions, coefficients which will conveniently express these relations are now used. In a previous paper (loc. cit.) the writer proposed L/W as the coefficient of length and T/L as the coefficient of thickness. The size of these coefficients as applied to any given lot of tubers is in direct proportion to the mean elongation and the mean thickness respectively of the tubers measured.

The Potato Association of America (4) at its third annual meeting in 1916 selected so-called ideal tuber specimens of the five leading varietal types produced in the United States. These were measured to establish their length, width and thickness. The purpose of these measurements as stated at the time was to "provide a standard which should be of service in making comparisons in studies of tuber-shapes." Using these measurements, the writer has calculated the tuber-shape coefficients of both length L/W and thickness T/L as shown in table 2.

TABLE II.—Tuber Dimensions and Shape Coefficients of Important Potato Types Based on Measurements Adopted by the Potato Association of America.

	Length (inches)	Width (inches)	Thickness (inches)	L/W	T/L
Cobbler	2.750	2.440	2.190	1.127	.796
Triumph	2.813	2.813	2.250	1.000	.800
Early Ohio	3.938	2.813	2.375	1.400	.603
Green Mountain	4.250	2.875	2.000	1.478	.471
Rural	3.625	2.938	2.000	1.234	.552

Tuber-Shape Coefficients for Ideal Standard Types

For purposes of instruction and study of potato variety classification, the Department of Vegetable Gardening at the New York State College of Agriculture each year selects what might be considered ideal tuber specimens of various varieties of each of the twelve classified groups proposed by Stuart (6). Using the best of this material, the writer has calculated the coefficients of length and of thickness respectively for 14 potato types including all three sections of the Rose group. Although in some instances relatively few tubers were measured, the material was all highly selected and the coefficients may therefore be considered as fairly representative of typical shape in the respective tuber-types. The coefficients together with the average dimensions of the tubers measured are shown in table 3. A compari-

TABLE III.—Tuber-shape Coefficients of Selected Tubers of Commercial Potato Types.

TYPE	No. of Tubers Measured	Average Length (cm.)	Average Width (cm.)	Average Thickness (cm.)	Coefficient of length L/W	Coefficient of Thickness T/L
Cobblers	9	7.94	7.71	6.17	1.030	.777
Triumps	19	6.43	6.54	5.25	.983	.816
Early Michigan	6	8.88	5.88	4.87	1.510	.548
Rose Sec. 1	43	10.81	5.62	4.25	1.923	.393
Rose Sec. 2	8	7.81	6.84	4.70	1.142	.602
Rose Sec. 3	6	9.25	7.35	5.25	1.259	.568
Early Ohio	8	7.06	5.43	4.79	1.300	.678
Hebron	4	13.50	7.55	5.50	1.788	.407
Burbank	5	12.76	6.54	5.32	1.951	.417
Green Mountain	31	8.91	6.51	4.71	1.369	.529
Rural	63	8.99	7.57	5.37	1.188	.597
Pearl	18	6.63	6.18	4.62	1.073	.697
Peachblow	8	6.65	5.50	4.49	1.027	.675
Upto-date	12	8.57	6.44	4.86	1.331	.567

son of these coefficients with those of the five types shown in table 2 results in very close agreement. It is suggested that these cofficients may serve as standards for use in experimental studies where various cultural or environmental factors affecting shape are involved.

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EXPRESSING our appreciation to the Potato Association of America for its patronage during 1928.

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PRINTERS FOR THE AMERICAN POTATO JOURNAL

Program of the Fifteenth Annual Meeting of the Potato Association of America

December 27-29, 1928

COLUMBIA UNIVERSITY, NEW YORK
Dodge Hall, T. C., Room 206

Thursday Morning Session, December 27, 9:30 a. m.

1. President's Address (10 min.)—F. M. Harrington, University of Montana, Bozeman, Mont.
2. Report of the Secretary-Treasurer (20 min.)—H. C. Moore, East Lansing, Mich.
3. Appointment of Committees (10 min.)
4. Report of Research Committee (30 min.)—Wm. Stuart, Chairman, U. S. D. A., Washington, D. C.
5. Report of Committee on Seed Potato Certification (60 min.)—Wm. H. Martin, Chairman, New Brunswick, N. J.

Thursday Afternoon Session, December 27, 1:30 p. m.

6. The Ventilation of Seed Potato Warehouses (15 min.)—Kris P. Bemis, Albert Miller Company, Chicago, Ill.
7. Potato Storage in Nebraska (15 min.)—H. O. Werner, University of Nebraska, Lincoln, Neb.
8. Potato Storage Problems in New York (15 min.)— E. V. Hardenburg, Cornell University, Ithaca, N. Y.
9. The effect of Different Storage Temperatures on the Vigor of Seed Potatoes (15 min.)—P. M. Lombard and Wm. Stuart, U. S. D. A., Washington, D. C.
10. The Effect of Length of Storage on the Sprouting of Potatoes (15 min.)—John Bushnell, Experiment Station, Wooster, Ohio.
11. Storage of Cut vs. Whole Seed (15 min.)—John S. Gardner, University of Kentucky, Lexington, Ky.
12. Contact Frost in Potato Shipments (15 min.)—John Tucker, Central Experimental Farm, Ottawa, Canada.
13. The Effects of National and State Activities on Marketing the Potato Crop (15 min.)—Wells A. Sherman, Bureau of Agricultural Economics, Washington, D. C.
14. Why Long Island Potatoes Top the New York Market (15 min.)—H. R. Talmadge, Riverhead, Long Island, New York.
15. Practical Aids in Marketing New Jersey Potatoes (15 min.)—W. W. Oley, Department of Agriculture, Trenton, N. J.
16. The How and When of Marketing Certified Seed (15 min.)—Mr. Boulter, Secretary, P. E. I. Potato Growers' Association, Charlottetown, Canada.

Friday Morning Session, December 28, 9:30 a. m.

Business Meeting.

17. Reports of committees and election of officers (30 min.).
18. Further Experiments on Chemical Treatments for Dormant Potato Tubers (15 min.)—F. E. Denny, Boyce Thompson Institute, Yonkers, N. Y.

19. Influence of Rotting Seed Pieces upon the Yield of the Potato Plant (15 min.)—F. E. Denny, Boyce Thompson Institute, Yonkers, N. Y.
20. Deterioration of Corrosive Sublimate in Solution as Applied to Seed Treatment of Potatoes in Prince Edward Island (15 min.)—R. R. Hurst, Laboratory of Plant Pathology, Charlottetown, P. E. I., Canada.
21. Seed Treatment Reduces but Does Not Control Blackleg in Potatoes (15 min.)—Central Experimental Farm, Ottawa, Canada.
22. Summary of Published Work on Seed Treatments (15 min.)—Wm. H. Martin, Experiment Station, New Brunswick, N. J.
23. Altering Tuber Size by Treating Seed Potatoes with Thiourea (15 min.) —H. O. Werner, University of Nebraska, Lincoln, Neb.
23. Seed Potato Treatment Studies with Special Reference to Ogranic Mercury Compounds—C. H. Clayton, Experiment Station, Riverhead, N. Y.

Friday Afternoon Session, December 28, 1:30 p. m.

24. The Potato Our Best Food Staple (30 min.)—Dr. John Harvey Kellogg, Director Battle Creek Sanitarium, Battle Creek, Mich.
25. Potatoes in the Diet (20 min.)—Prof. Elizabeth Whittaker, Home Economics Department, Michigan State College, East Lansing, Mich.
26. Value of Potatoes in the Diet (30 min.)—Dr. Mary Swartz Rose, Teachers College, Columbia University, New York.
27. Problems of the Potato Chip Manufacturer (15 min.)—A. A. Walters, Albany, N. Y.
28. The Potato Situation and the Future of the Industry (2 hrs.)—Discussions led by F. P. Hibst, General Manager, Michigan Potato Growers' Exchange, Cadillac, Mich.; Geo. J. Cannon, Agricultural Development Agent, Great Northern Railway Company, Spokane, Wash.; E. D. Askegaard, Moorhead, Minn.

Saturday Morning Session, December 29, 9:30 A. M.

29. The Value of Tuber Index and Tuber Unit Method in Seed Potato Improvement (15 min.)—Dr. Wm. Stuart, U. S. D. A., Washington, D. C.
30. Tuber Index Work in Relation to Seed Certification (15 min.)—H. O. Werner, University of Nebraska, Lincoln, Neb.
31. The Need of a More Rational Basis for Certification Standards (15 min.) —H. O. Werner, University of Nebraska, Lincoln, Neb.
32. Seed Plots; Their Value in the Red River Valley (15 min.)—E. M. Gillig, Moorhead, Minn.
33. Growing Certified Bliss Triumphs in New Brunswick (15 min.)—C. H. Goodwin, Laboratory of Plant Pathology, Fredericton, N. B., Canada.
34. The Yield of Northern Seed Potatoes in Florida (15 min.)—L. O. Gratz, Hastings Laboratory, Hastings, Fla.
35. Experimental Spraying and Dusting in Aroostook County (15 min.)— Reiner Bonde, Experiment Station, Orono, Maine.
36. Breeding for Late Blight Resistance (15 min.)—Donald Reddick, Cornell University, Ithaca, N. Y.

Saturday Afternoon Session, December 29, 1:30 p. m.

37. Potato Disease Work in the Northwest (15 min.)—H. E. Morris, Montana Experiment Station, Bozeman, Mont.
38. Virus Diseases (15 min.)—E. S. Schultz, Department of Agriculture, Augusta, Maine.
39. Potato Breeding Work (15 min.)—F. A. Krantz, College of Agriculture, University Farm, St. Paul, Minn.

40. Factors Influencing Tuber Size Control (15 min.)—C. C. Starring, Experiment Station, Bozeman, Mont.
41. The Effect of Different PH Concentrations Upon the Yield of Potatoes (15 min.)—P. H. Wessels, Long Island Vegetable Research Farm, Riverhead, N. Y.

Editor's Note: This program is subject to change. The final program will be available December 15, and can be procured from the Secretary.

REDUCED RAILROAD RATES

Reduced fares have been arranged for by the American Association for the Advancement of Science. Secure a certificate when purchasing your ticket to New York. When registering at the headquarters of the Science Meetings, leave the certificate for validation. Later it will be returned and will entitle you to one-half fare on the return trip.

HEADQUARTERS

The headquarters for the Potato Association of America will be the Hotel McAlpin, Broadway at 34th St., New York City.

Crop and Market News

CROP REPORT ANALYZED

(Contribution from the Bureau of Agricultural Economics.)

Careful analysis of the November crop report on potatoes is necessary to avoid a mistaken conclusion from the figures. Estimate of the total 1928 crop, both early and late potatoes, was increased by nearly 2,000,000 bushels during October to a total of 465,651,000, compared with 407,000,000 last season and a five-year average of 394,000,000 bushels. Decreases in some sections partly offset the gains elsewhere. But a great part of the increase resulted from revision of the figures for intermediate states, which are nearly through shipping. A combined total of 2,600,000 bushels was added to the estimate for Virginia, Maryland, New Jersey and Missouri, but this portion of the net increase can be mostly ignored, as referring to past shipments, although including also some additions of late-planted potatoes. More important is the gain of 1,000,000 bushels in Pennsylvania, 500,000 in Minnesota, 630,000 in North Dakota and 600,000 bushels in Oregon. However, the combined increase of 2,730,000 bushels in these four states is more than offset by decreases of 1,000,000 bushels in Wisconsin, 200,000 in Maine, 1,700,000 in Idaho, Washington and Montana together, and a cut of 300,000

bushels in California. The estimate for Iowa was also reduced by 440,000 bushels during October. Therefore, the total deductions in the leading late states were greater than the total gains, and the supply available for winter markets is probably decreased.

Farm Prices Low

The average price paid to producers on October 15 was 58c per bushel. This compared with 65c in mid-September, 73c in mid-August, and 98c in October of 1927. Lowest price (or average) of 30c per bushel was being paid in North Dakota, with a 35c level in Wisconsin, Minnesota, Colorado and Idaho, and 40c in Maine and South Dakota. Highest price of $1.45 was reported in Arizona. The general average for North Atlantic states as a group was 63c, as against 46c in the North Central states, and 49c in the western territory. South Atlantic states reported an average of 84c, compared with 94c in the South Central area.

Heavy Yields

Average yield of potatoes in the United States this season is estimated at 121 bushels per acre, which has been previously exceeded only once, in 1924. Maine ranked first, with 220 bushels to the acre; Idaho second, with 170 bushels, and New Jersey third, with 162 bushels. With the plantings of potatoes largely increased in nearly all important states as a result of encouraging prices for three years, and with the yield per acre the second highest on record, there appears to be a large supply of potatoes in all parts of the country. The estimate for this season includes some potatoes that may not be harvested and a considerable quantity of second-grade stock that will not be marketed.

Shipments Decreasing

Carlot movement from the leading or main-crop states was decreasing week by week, and during the seven days ended on November 10 the output was only 4,300 cars, as against 6,190 for the same period a year ago. Maine was credited with 915 cars during the week under consideration, New York shipped 440, the North Central area a total of 1,475, and Colorado and Idaho about 375 cars each. A combined total of 55,400 cars for this season to date was 25,600 cars (or about one-third) less than to early November, 1927. The only sections exceeding last year's corresponding record were Pennsylvania, Michigan, Oregon, and southern and central California.

Considerable fluctuation of shipping-point prices occurred during the month, and November found the market somewhat stronger than in early October. The northern Maine f.o.b. market on sacked Green Mountains was firm at 80c per 100 pounds, and western New York Round Whites sold at 95c in important

shipping districts. The shipping-point range in North Central states was 60c-75c, with Idaho Russet Burbanks fairly steady in the southern part of that state at 75c-90c. Colorado potatoes returned 60c-95c, depending mainly on variety. Northern Round Whites were quoted on a carlot basis in Chicago at 75c-90c per 100 pounds, while Red River Ohios ruled 95c and Idaho Russets $1.60-$1.75. General jobbing range in the east was $1-$1.50. Prices in western producing areas are only slightly below those of a year ago, but eastern and northern potato states report a price level just about half as high as last season.

"Main-Crop Potatoes, 1928-29" is the title of a special mimeographed report, issued on October 30 by the Federal Bureau of Agricultural Economics, at Washington. Growers who have not received a copy can get one on request to Washington.

Notes

CANADA

COMMERCIAL POTATO PRODUCTION

The October potato crop report issued by the Dominion Fruit Branch indicates an increase of 9 per cent in the Dominion potato crop over last year, with 50,794,000 cwt. as compared with 46,458,000 cwt. in 1927; this amount being produced off 597,621 acres, which gives an average yield of 85 cwt. per acre as compared with 90.4 cwt., the average for the period 1918-27. Production is divided by the Great Lakes, with the eastern provinces, including Ontario, Quebec, New Brunswick, Nova Scotia and Prince Eward Island, showing an increase of 17 per cent, with an estimated total yield of 40,912,000 cwt. against 34,774,000 cwt. in 1927, and the western provinces, including the three Prairie Provinces and British Columbia, showing a decrease of 16 per cent, with 9,881,000 cwt. against 11,684,000 a year ago. Condition is placed at 95 per cent, which is slightly below average.

Prince Edward Island: Reports state that blight has not seriously affected the shipping qualities of potatoes. The crop indicates an increase of 26 per cent with approximately 6,000,000 cwt. It is estimated that there are 6,000 cars to move from the island as compared with 6,480 a year ago. Quality is generally much superior to that of 1927.

Nova Scotia: The potato crop promises a good yield and it is estimated at 3,268,000 cwt. or a 22 per cent increase over last year.

New Brunswick: The average yield this year is indicating approximately 80 barrels per acre, and should produce a total crop of approximately 5,800,000 cwt. or an increase of 39 per cent over 1927. Quality is generally good, while Cobblers of large size are indicating hollow heart. Early blight has somewhat reduced the yield in late varieties. The carlot movement is estimated at approximately 11,000 cars against 8,000 cars a year ago.

Quebec: The potato crop is below average, and is suffering from blight rot in many sections, while in some districts south of the St. Lawrence, conditions are reported to be satisfactory. The crop about equals that of last year, with approximately 14,000,000 cwt.

Ontario: Reports from Central, Eastern and Northern Ontario show that there is some rot present. In Eastern Ontario, particularly in the Uxbridge District, the crop is very good and the yield above average, but some sections report about 25 per cent of the early crop still unharvested. The shipping points of Orangeville, Hillsburg, Shelburne and Orton and nearby leading centers estimate the carlot movement to be 1,200 cars as compared with 950 last year. The provincial estimate shows an increase of 28 per cent with approximately 12,000,000 cwt.

Manitoba: The potato outlook for this province indicates a yield of 2,233,000 cwt., which represents a decrease of 4 per cent compared with last year. Most of the production will be consumed locally. The majority of the commercial crop is produced in the Winnipeg District, while Dauphin and Balmoral are the principal outside shipping points that promise a good movement.

Saskatchewan: This province shows a 12 per cent decrease in the yield compared with last year, with 3,400,000 cwt. Potatoes are generally small, which is the main cause of the reduced yield. Judging from the sample of potatoes already dug, the majority of the crop will pack out "B" grade and lower.

Alberta: The crop is generally light in this province, showing a decrease of approximately 23 per cent. In the Vauxhall and Lethbridge District, quality is good and the yield averaging three to four tons per acre. It is estimated that this district will ship approximately 122 cars against 165 last year. Reports from the Edmonton District show that the yield is variable, running from 50 to 100 per cent of last year. The tubers are fairly large and clean.

British Columbia: The potato crop has suffered considerably owing to continued drought. The estimate is placed at 1,729,000 cwt. as compared with 2,270,000 in 1927, or a decrease of 24 per cent.

—J. T.

SEED POTATO CERTIFICATION IN BRITISH COLUMBIA

In the province of British Columbia, certification of seed potatoes was begun in the year 1921, by the provincial Department of Agriculture, under its own standards and regulations. Two years later both federal and provincial officials were cooperating, with the one official standard (Dominion) in effect for the whole of Canada. In 1927, the inspection service was taken over by the Dominion Botanist and a Dominion official was appointed as district inspector, to supervise the work, the Provincial department cooperating.

The work is now conducted by the Dominion Department of Agriculture, the system, the standards and regulations being now the same as those governing the work in other provinces. The term "British Columbia Certified Potatoes" is no longer used; and certified seed from this province, as from others, is now known as "Extra No. 1 Certified Seed." To each container of seed sold as certified must be attached an official tag, issued by the federal department.

During the first years of inspection and certification, the efforts were confined to improving the quality and yields of commercial crops by the use of improved seed, and to standardizing the varieties being grown. The acreage grown for certification each year was not large, and the local markets for this seed were quite limited. Only about 20,000 acres are planted to commercial potatoes in B. C., and 80 per cent of these are grown by Orientals, who seem unwilling to buy the comparatively high priced certified seed. As the production of certified seed increased, therefore, it became necessary to look for export markets. The surplus has been confined to seed of the later varieties (Netted Gem, Burbank, Wee McGregor, etc.) while the demand has been for early varieties. This demand, unfortunately, could not be met, as there was no satisfactory foundation seed stock of early varieties in the province; and it was decided to import the best possible seed stock of the two early varieties most in demand; namely, Irish Cobbler and Bliss Triumph. A minimum car lot of Irish Cobbler was obtained from Prince Edward Island, whose seed stock is well and favourably known throughout Canada and many of the eastern and southeastern states. This gave good results in British Columbia, and it is felt that a good foundation of this variety has been laid, both for the certified seed industry and for the early commercial market.

It was more difficult, however, to obtain any large quantity of good Bliss Triumph seed, though a small quantity of the Sharples strain of this variety was secured from Montana. This strain is very much desired because of its freedom from mosaic and its high yielding quality. Those who grew this seed are well pleased with the results, and it is believed that a good foundation has been laid of this variety also.

After meeting local demands for next year's planting, it is quite probable that at least a carload of certified Irish Cobblers will be exported as a trial shipment. The present outside demands for Bliss Triumph seed cannot, unfortunately, be met, as all of this seed will be required for local markets. A small quantity, however, will be shipped for trial purposes. This variety appears to be the most suitable for British Columbia's prospective export trade, which is beginning to look quite promising.

—H. S. MAC LEOD.

Manitoba and Eastern Saskatchewan

The 1928 crop of certified seed in Manitoba considerably exceeds that of 1927; the acreage which passed field inspection being greater by 125 per cent, and the yields also being higher.

Some P. E. I. Irish Cobblers were planted, and did very well where soil conditions were favourable. This variety has been somewhat out of favour with the growers up to now, it having been grown as a main crop, giving large, hollow and rough tubers. The results from the P. E. I. strain have done much to make this variety more popular. Growers were advised to plant about 20 bushels to the acre and larger crops of smaller and more uniform tubers were obtained. There is now a quantity of this strain for sale. We would be pleased to supply small lots to any concerns wishing to give it a trial.

The potato crop as a whole has been good; and this, together with the low prices in neighbouring states, has kept prices low.

The Saskatchewan yields were low, due to a very dry spring, a wet summer, and a killing frost in August. Cities had to get most of their supplies from Alberta and prices have been high. Climatic conditions also caused a shortage of certified crops; but there is a good supply of Early Bliss and Bovees.

—J. W. SCANNELL, District Inspector, Indian Head, Sask.

Storage of Certified Seed in New Brunswick

Certified seed growers find that sound frost-proof storage houses are necessary to protect their crops from the severe weather during the winter months, and though various types of storage houses are seen in the province, the main principle in their construction is the same.

A cellar is constructed in a side-hill or knoll, the walls, and frequently the floor, being made of concrete. Over this cellar is erected a wooden shed, with a door at each end to allow the passage of the potato wagons, and with a wooden floor, strong enough to bear the weight of the loaded wagons.

The cellar is divided into two or three bins, space being left at

the rear of the cellar for racking and sorting, and the heating apparatus. The bins are partitioned off with a double wall of slatted material, while horizontal wooden ventilators are placed some ten feet apart in the center of each bin. Thorough ventilation, which is so essential to good storage, is thus assured.

The loaded wagons are driven into the upper shed, and the bins are filled through trap doors in the flooring. A chute made of heavy sacking, with a wire attached to the loose lower end, reaches from each trap door to the bin beneath. The potatoes are first racked, to remove dirt and grass, etc., and then are lowered into a chute which is held horizontally by the wire end. As each barrel is emptied, the wire end is slowly lowered, and the potatoes roll into the bin gently enough to avoid bruising. When the bin is nearly full, the potatoes are emptied directly from the barrels to the bin, the chute then not being necessary. Finally, the potatoes are leveled off, a space of 18 inches being left between them and the upper flooring, to allow the air to circulate freely.

—C. H. GODWIN.

Alberta

The policy of the Inspection Service in the Prairie Provinces is, firstly, to develop a local trade in certified seed, and then, as the industry grows, to reach and supply outside markets.

At first, a large percentage of certified seed was sold directly from one grower to another. With the increased demand from their customers for high grade seed, however, wholesale and large retail seed firms became active buyers; and the growers now usually sell their certified seed in larger lots to these firms. It is hoped that this practice will stimulate the growing of certified seed, and that local trade will continue to develop.

A few of our best growers have been improving and increasing the Sharples' strain of the Bliss Triumph variety for the last two years; and next year we expect to have available some 8 to 10 carloads for sale. This seed is being grown much further north than any seed of this variety previously available, in a district where the growing season is very short and the vegetation growth very rapid; and, when grown further south should give exceptionally vigorous and clean crops.

Anyone wishing to make a plot test can obtain a small supply of seed through the District Inspector, Dominion Experimental Farm, Indian Head, Sask.

—J. W. MARRITT.

Prince Edward Island

Bin inspection for certification, which has just been completed, shows that the tubers in most sections are a better type than last year, although in some instances Cobblers are somewhat smooth. Late blight infection is negligible in Cobblers, but

some Green Mountains were rejected in the bin because the 3 per cent allowance was exceeded. No trouble is anticipated, however, with late blight rot in the graded stock.

The average yield was approximately 235 bushels per acre, early and late blight having been responsible for yield reduction. Some growers report yields up to 350 bushels.

In view of the unstable condition of the market, the demand for seed up to the present time is as active as could be expected.

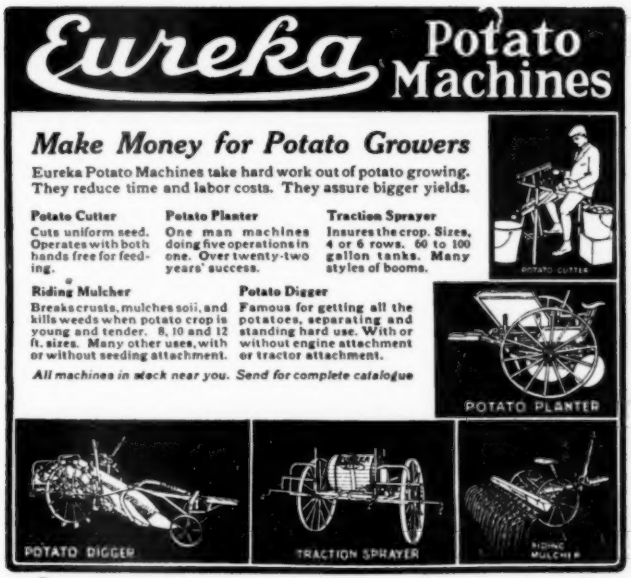
—J. T.

MONTANA

Can Boys Produce Certified Seed Potatoes?

The question whether boys can produce certified seed potatoes has, I believe, been answered to the satisfaction of anyone who has observed the work of the Prairie County Boys 4 H Potato Club the past two years. Not only have these boys demonstrated that they can produce high quality seed stocks but they have demonstrated that there is a way to interest boys between the ages of 16 and 21 years in farm projects and the business of farming.

In 1927 in Prairie County, Montana, on the outer rim of the great plains, a problem presented itself as to what could be done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through the county extension program in order to interest the farm boy between his "smart" age and the time he will go on his own. The certified seed potato game seemed to me to be fascinating enough as well as holding out something to these boys as a money-making business whereby their interest might be caught and their energy turned into a very satisfactory demonstration for the potato growers themselves.

The plan was to get boys who were above 16 years old and who were beginning to weary of farm operations, but who were by temperament destined to become ideal farmers. They were carefully selected and interviewed personally, emphasizing the fact that they had been selected for this important job. Fifteen boys agreed to do the work.

First class seed stock was secured of Bliss Triumph and Sharples strain and each boy was shown how to treat his seed. All were required to plant under the tuber unit system. The fields were inspected and the boys taught to read diseases. The boys were required to keep their fields absolutely free from weeds. The State Field Inspector also gave valuable assistance to each boy and 13 of the 15 met the rigid requirements of the Montana Potato Association for certification.

The boys were then taught to grade and cull their seed stock and put it in first class condition for shipping.

Individual instruction was given each member of the club in the selection of seed from the field by taking only potatoes from high producing hills and of ideal type for their 1928 planting.

This club produced a carload of seed stock to be shipped out of the county, and Colorado was the lucky state. Each boy in the project netted an average of $118.60 for his acre of ground besides his seed for this year's planting.

The boys in the 1928 club were allowed to plant up to 5 acres. New members were confined to a one acre maximum. All the boys had to tuber unit every potato they planted. We added eight new members to the club this year and had applications from many others but a limit had to be set for the year. Practically every boy has met requirements this year and harvest is now on and the crop looks good so the finish should be good.

The fact that each boy keeps a record of his costs and receipts has taught these boys that to know your business in dollars and cents is one of the big secrets of farming successfully.

Next year we lose nine boys from the club as they will be 21 years old and ineligible. We have six boys who are between 19 and 20 and the balance average 17½ years old. The boys who are leaving the club are going into the seed potato game for themselves. They have learned the business and I have no fear of their success in the future.

—G. E. LEWIS, County Agent, Terry.

COLORADO

The 1928 Potato King in San Luis Valley

The 1927 Potato King in San Luis Valley, Colorado, won his silver crown with a yield of 49,993 pounds of Peach Blow potatoes per acre—833 bushels. L. G. Schutte of Monte Vista, Colo., this year with Brown Beauties made the record yield of 62,845 35 pounds, or 1047.5 bushels per acre. This crop of spuds was grown on ground that had been in alfalfa for several years. This potato farmer also fertilized the ground with 40 loads of well rotted stable manure per acre. For six years now this careful potato farmer has been carefully hand selecting his seed. From his choicest seed this spring his contest area was planted. This is some record for a great commercial potato district, the greatest in the Centennial state, when this season 36,000 acres were planted to potatoes. The Valley School at Alamosa, November 13, 14, and 15, that sponsors this contest, will present Farmer Schutte with the silver crown making him the Potato King of the San Luis Valley. He will also receive a substantial cash prize from the Farm Bureau.

Good seed, good fertilization and good farming was the secret of this success.

All Hail King Schutte!

Who will be the next member of the San Luis Valley 600 Bushel Potato Club to wear a potato crown?

—W. H. OLIN.

CONNECTICUT

On October 17, Hartford and Tolland Counties cooperated in conducting a "Potato Field Day" on the farm of J. J. Bermant of Ellington. Judging from the large crowd of several hundred interested people present and the smoothness with which the scheduled events took place, the day was a great success.

The purpose of this field day was not to encourage the growing of more acres of potatoes, but to demonstrate more efficient methods, whereby the cost per bushel of raising potatoes may be reduced.

From 10 a m. until 12:30 p. m. several types of diggers, including one "combine" which sacked as well as dug the potatoes, showed what they could do in "turning out" spuds.

After lunch, Prof. A. W. Manchester, Extension Specialist in Farm Management at the Connecticut Agricultural College, talked on the potato outlook. He pointed out that, although a record crop was promised for the country, potatoes should not drop to "panic" prices in the east, for New England and New York had only average crops, the nearest surplus producing

state being Michigan. Freight and handling charges from distant regions should allow the local growers to compete successfully. In regard to the 1929 outlook, Professor Manchester said that, judging from price trends since 1870, it was a 50-50 proposition whether better prices would be obtained next October (Connecticut prices now range from 75c to $1.00 per bushel). He suggested that the best guide is to follow carefully the reports of "intentions to plant" next March.

Picking up and yield guessing contests completed the program. Six contestants, spurred on by the cheers of the spectators and the $5, $3 and $2 rewards, did some rapid work, each of the three winners picking up and sacking from 17 to 19 bushels from a 600 foot row in approximately 31 minutes. It was a close race!

Three 100 foot sections were marked for the yield per acre guessing contest, in which practically everyone present "took a chance." The yield was found to be 523 bushels per acre and a young lady won first prize with a guess of 500. The majority of those present underestimated the crop.

Although most of the specialized growers are obtaining excellent yields this year, the average over the state will probably be lower than in 1927, due to attacks of late blight, weed competition, poor "set," etc.

—B. A. BROWN.

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The potato crop of New York State was very fortunate when the wet weather of spring and summer suddenly turned to drought around September 1, and conditions remained dry to past the middle of October upstate. This drouth completely stopped the attack of late blight which was general over all that section. The dry soil prevented infection of the tubers in most fields, and tuber rot when present is seldom severe. The dry soil before and during harvest has caused the crop to ripen up bright and smooth, as is shown by its good condition on arrival at city markets. While the drouth at the time the crop most needed rain prevented many heavy yields, it was favorable in that the crop produced was of just the right medium size city markets like best. Local demand in the many large manufacturing cities of upstate New York has been very good.

—DANIEL DEAN.

Results of Potato Shippers' Meeting, Stevens Hotel, Chicago, October 31, 1928.

Upon motion duly seconded and unanimously carried, the following action was taken:

1. That the handlers of potatoes in all shipping districts make a study of the situation in their territory with a view of effecting an improvement in the grading of potatoes.

2. That growers and shippers confine their shipments of potatoes to those grading U. S. No. 1 as determined by federal inspections, and that all potatoes should be free from dirt or other elements that detract from appearance and affect market conditions.

3. That so far as possible federal inspection of potatoes be secured at shipping point or in the shipping district.

4. We recommend the adoption of state laws requiring compulsory grading and inspection. Further that where such laws are now in effect or may hereafter be passed, the officers in charge see that such laws are properly administered and enforced in accordance with the terms thereof.

5. That the railroads and the shippers regional advisory board be requested to lend their cooperation by acquainting the growers and shippers of potatoes with the record outlined above and urge all to comply therewith.

6. That the U. S. Department of Agriculture be also re-

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RECORD OF GOVERNMENT FIELD INSPECTION, 1928

FIELD INSPECTION OF POTATOES—NOVA SCOTIA—1928

Name and Address	Variety	Acres	Inspection No.	Black Leg %		Leaf Roll %		Mosaic %		Wilt %		Foreign %	
				Inspection 1st	Inspection 2nd	Inspection 1st	Inspection 2nd	Inspection 1st	Inspection 2nd	Inspection 1st	Inspection 2nd	Inspection 1st	Inspection 2nd
Herbert	I.C.	5	7001	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Olyer, Ltd.	I.C.	6	7003	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Walter Steel	I.C.	4½	7861	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
strain, R. R.	I.C.	—½	7864	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
No. 1, Halls	I.C.	1	7866	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Harbor,	G.M.	5	7860	.....	.....	0.16	.....	0.16	.....	.....	.....	.....	.....
Kings Co.,	G.M.	—½	7863	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
N. S.	G.M.	2½	7865	.....	.....	.....	.....	0.3	.....	.....	.....	.....	.....
	G.M.	8½	7873	.....	.....	.....	.....	0.14	.....	.....	.....	.....	.....
	G.M.	6	7874	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	G.M.	13	7875	.....	.....	.....	.....	Seen	.....	.....	.....	.....	.....
	G.M.	8	7876	.....	.....	.....	.....	Seen	Seen	.....	.....	.....	.....

quested to lend its influence in this campaign of improvement as mentioned above and to cooperate in educating the public as to the food value of potatoes.

7. That the daily press and trade press and other publicity channels as well as state agricultural colleges and department experimental stations, county agricultural bureaus and local commercial clubs, especially in the potato shipping districts, be urged to take an active part in assisting in carrying out the program outlined herein.

8. That the Potato Division of the American Fruit and Vegetable Shippers' Association be requested to use their facilities to accomplish initial distribution of the above record and solicit cooperation of all interests in making the plan effective.

9. It is the sense of this meeting that steps be taken to organize the potato grower, shipper, dealer and handler into a national association. For reasons of economy and otherwise, that such organization be affiliated with and under the supervision of the American Fruit and Vegetable Shippers Association, a national shipping organization already in operation.

10. That a committee of not less than 10 be appointed by the chair, representing each of the important potato shipping sections of the country, to work out a suitable plan of organization and report back at a future meeting to be announced by the chair. That this committee, in its plan of formation, take into consideration the need of some suitable form of publicity for the potato and the proper financing thereof.

11. That all fruit and vegetable trade associations or other organizations who are directly or indirectly interested in potatoes, are urged to cooperate with the special committee so as to aid in bringing about a consolidation of all groups or organizations.

It was further recommended on motion duly seconded and unanimously carried that every possible channel of publicity be utilized to advertize the potato shippers' meeting which was to be called for the Palmer House, Chicago, Ill., on Tuesday and Wednesday, December 4 and 5, 1928.

That a special invitation be sent to members of the American Railway Development Association through R. G. East, Pennsylvania Railroad, Shelbyville, Secretary, that this Association in a body attend the potato shippers' meeting scheduled for the Palmer House, Chicago, on December 4 and 5.

In adjourning the meeting, the chairman called attention to the need of and urged the presence of everyone at the meeting scheduled for the Palmer House, Chicago, December 4 and 5.

—E. S. BRIGGS, Secretary of Meeting.

Review of Recent Literature

Hartman, Fr. Ein neuer Weg zur Erhohung des Stargehaltes der Kartoffel Ill. (Transl.—A new method of increasing the starch content of the potato). Landwirt Zeitg. 48th year No. 34, pp. 433-434, August 24, 1928.

The author states that little attention has hitherto been paid to the beneficial effect of a lime application to potatoes. It is further asserted that everywhere, with no exception, an increase in yield has been obtained from an application of lime. In order to secure further data on this subject, lime was applied in June to growing plants which had previously received a complete chemical fertilizer. Four plats were used. Plat I was untreated, plat II received an application of carbonate of lime, plat III was treated with calconite, and plat IV quick-lime. The yields in order were as follows: 593, 653, 706 and 776 cwts.; the dry substance 24, 24.8, 26.1 and 27.4 per cent of dry matter; the starch content was 18.2, 19, 20.3 and 21.6 per cent. Thus it will be noted that the increases derived from lime applications were closely correlated with the availability of the lime content. A comparative study of the starch content of potatoes produced on plats I and IV shows an increase of 3.4 per cent in favor of plat IV to which quicklime was applied. It was noted that the plants on the limed plats produced larger, more vigorous and deeper green leaves and stems than on plat I. Another change noted was that of a rougher and firmer tuber skin from the limed than the unlimed plats. The lime was broadcast after the plants had attained some growth and was well worked into the soil.

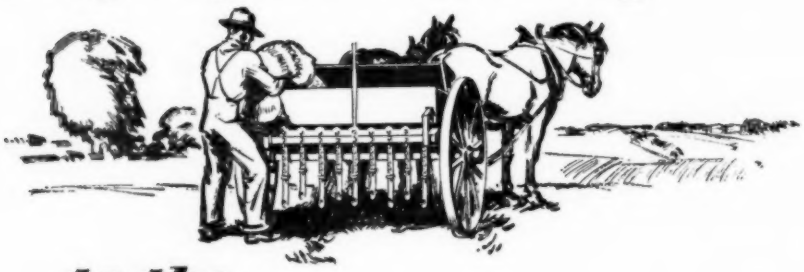
—W. STUART.

Tice, C.—Certified Seed Potatoes—Why They Will Pay. British Columbia Dept. Agr. Soil and Crop. Circ. No. 1 (Revised).

The author explains what certified seed potatoes are supposed to represent—quality and freedom from diseases—and the care required in growing such seed is emphasized. Attention is called to decreased yields from diseased seed and to the fact that because one plants good seed it is not necessarily a guarantee of a good yield unless the best cultural attention is given to it.

—W. S.

Right from the bag



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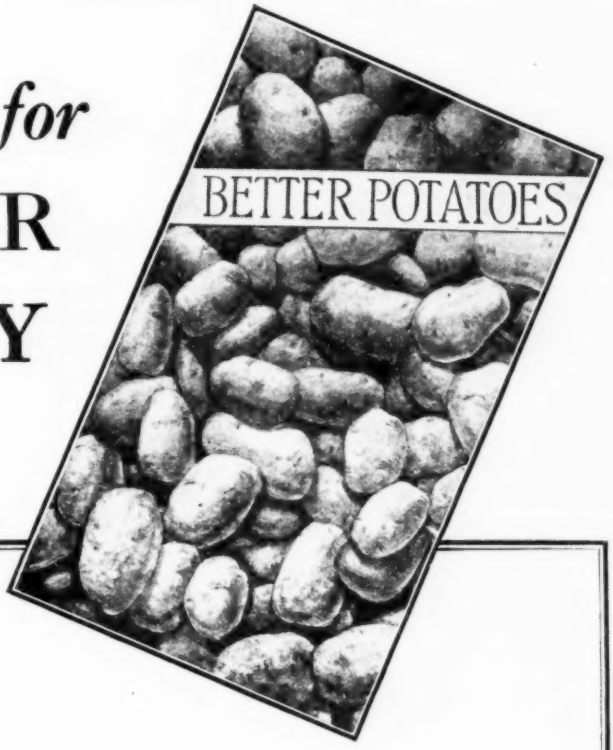

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The Kansas Compulsory Potato Inspection Law

J. C. MOHLER, Secretary State Board of Agriculture

A region noted for its splendid adaptability for potato-growing is the so-called Kaw Valley district in the state of Kansas. Commercial potato production in this Valley has been important for a good many years, but the potentialities of the industry were scarcely realized until comparatively recently, when results of variety tests, spraying demonstrations, seed treatment, and so on, were made manifest through extensive experiments, potato schools and shows and the annual tour through the valley each spring. This potato tour is really a caravan of the progressive growers who visit fields in every community to learn the lessons of various tests conducted by practical potato men. As a consequence of this educational program, the acre-yield of potatoes has been decidedly increased in the past decade, and the growers are keeping right abreast of the most modern methods of production. In fact, it may be said with considerable assurance that problems of production are being pretty rapidly solved as they appear.

Rather naturally the improvements in production resulting from these activities developed a desire for further progress in the industry, and the minds of the more enterprising turned to the important question of marketing. The value to the Valley of producing a uniform type of an adaptable variety was recognized some years previously and this brought about an almost complete change from the Early Ohio to the Irish

Cobbler. In this respect, then, the Valley was in good position to tackle a market program. The method that had been in vogue was the crude one of private dicker with the buyers who entered the field, with the inevitable and more or less constant disputes and bickerings between buyer and seller as to grade and quality, as there was no official inspection or grades. Each buyer and seller was a judge in himself, and as a consequence, there were as many grades as there were opinions. This was not only slip-shod and confusing, but was a situation that damaged the standing of the industry in the distant markets, because of lack of uniformity in the products consigned. A car represented as No. 1, say, by one shipper would not tally with a car bought and sold as No. 1 by another shipper, and there was likely to be as much variation in the opinions of ultimate purchasers. It was a condition that favored price manipulations and vicious marketing practices, and the local shipper was often at the mercy of the distant purchaser.

In an effort to improve marketing conditions, the first step was taken by the more enterprising growers of the Valley in the summer of 1923 in asking for voluntary inspection by the U. S. Department of Agriculture. Only a comparatively small number of growers joined in this, and 85 cars were inspected. The next season, however, claimed additional adherents, with inspection on 1,356 cars. The crop of 1925 was considerable of a failure, and only 281 cars were inspected. In 1926 more than 1,400 cars were inspected, but still a majority of the producers of the Valley seemed uninterested. The process was so slow as to try the patience of the leaders, who concluded that other methods must be followed. They reasoned, and properly, that little or no benefit would be derived by the industry of the valley with only about a quarter of the crop inspected and the rest not. So far as remote markets were concerned it left conditions muddled much as they were before. They figured that some scheme would have to be worked out that would apply to every grower in the valley relating to inspection and grading, if the Kansas industry was to be placed on a par in this respect with competitive districts of other states. They believed that to build up and maintain a reputation for Kansas grown poatoes it was necessary that the entire crop be marketed under government standards known and accepted throughout the markets of the United States.

The potato growers finally concluded to take the case to the State Legislature and ask the enactment of a compulsory potato inspection law. In cooperation with the Kansas State Agricultural College, the U. S. Department of Agriculture and the Kansas State Board of Agriculture, a bill was drawn requiring compulsory inspection, and presented to the Kansas legislature of 1927. This was in response to the demands of the growers who insisted that it was necessary for the welfare of the commercial Irish potato industry of the state. The bill was introduced by a member of the House of Representatives who was also a Kaw Valley Potato grower. It was referred to the appropriate committee. Several hearings were held by the committee. There was of course, a division of opinion as to the merits of the bill, and considerable skepticism prevailed concerning the compulsory feature, but the majority of the potato growers attending the hearings so strongly favored the bill, that it was unanimously recommended by the committee for passage. The bill was finally enacted into law by a vote of 94 to 2, in the House of Representatives, and 22 to 6 in the Senate. It was approved by the Governor, March 18, and became effective on its publication in the official state paper March 21, 1927.

Briefly the purpose of the law was to establish and maintain uniform and official standards in the marketing of Kansas grown Irish potatoes, based on quality and grade as determined by Federal inspection in cooperation with the state. While the statute is purely a compulsory inspection law, it is in actual operation a grading law also in its effect. The compulsory feature is incorporated in Section 2, of the law which provides for official designation of potato shipping and inspection points. This section practically limits the application of the act to regions where operations under its terms may be deemed practicable, and provides that in such regions "no railway or railroad company shall accept for shipment between the dates of June 15 and September 1 of each year, any carloads of Kansas grown Irish potatoes from any station which shall not have been designated by the state board of agriculture as an inspection shipping point" and further specifies that "The secretary of the state board of agriculture shall designate as potato shipping points in Kansas prior to June 15 of each year, all shipping points where, in his judgment, the number of cars shipped will pay the expense of official inspection and proper notice shall be sent to each point so designated, at which points all cars shall be officially inspected." This section also contains that "At all points not designated and notified as above provided, no inspection shall be required."

The operative period, under the law, is "between the dates of June 15 and September 1," and during this period it is unlawful to ship any carload of potatoes from any designated shipping point in Kansas without official inspection and the placard showing the grade of potatoes which the inspector is required to post in the car. The railroads have given the finest kind of cooperation under the law, and have not released a single car for shipment until all the requirements of the law have been complied with. In return, the state board of agriculture promptly files with the station agent at billing point, a copy of the inspection certificate, and the agent stamps on the bill of lading the grade of potatoes as shown by the inspector's report. This explains fairly well, it is believed, the compulsory feature. That is, no carload can move that is not inspected. The grower is not compelled to grade, he can load field-run if he elects, but the car must be inspected and a certificate issued. In fact, a few growers declared they would not grade, that it did not pay the cost, and that they would load field-run. To their credit it must be said that they did not carry out any such ideas, and while there was variation in the degree of efficiency in which it was done, the potatoes that moved out of the Kaw Valley last year were all graded.

The Kansas state board of agriculture was made the administrator of this potato inspection law. It promptly proceeded to discharge its duties by making investigations, and after a public hearing at Lawrence, in the heart of the commercial potato growing region, attended by a representative group of Kansas potato growers, adopted standards for grading and classifying Kansas grown potatoes. The government grades, U. S. No. 1 and U. S. No. 2 were adopted, together with a grade known as Kansas Combination, of a standard approximately midway between the U. S. Nos. 1 and 2, and into which classification it was anticipated a considerable portion of the Kansas crop would fall, and an unclassified grade consisting of potatoes not meeting the requirements of the other three grades.

The next step on the part of the board was to make an agreement of cooperation with the United States Department through the Bureau of Agricultural Economics, as authorized by law, with respect to the inspection service. This was accomplished in a satisfactory manner, and provided that the Federal Department designate a trained supervising inspector who issued federal licenses to inspectors employed whenever in his judgment such inspectors were competent to inspect and certify as to grade, quality and condition of potatoes in accordance with federal requirements, and with the rules and regulations adopted by both the federal and state departments.

This was in effect government inspection, based on approved grades, although the certificates of inspection were issued jointly by the state and government. Under this agreement the state pays the entire cost of inspection, including the salary, expenses and per diem of the government supervisor while in the service of the state, as well as 10 cents a car to the government for overhead.

The fund to defray the cost of inspection is derived from a fee of $3 for each car inspected, and this fee is paid by the shipper to the secretary of the state board of agriculture. The $3 is the maximum fee for inspection, and it is provided that when there has been accumulated in the inspection fund at the end of any calendar year the sum of $5,000, then the fee for inspection shall be reduced to two dollars per car until the surplus is reduced to $2,500, when the fee shall automatically return to $3.

The season of 1927, the first year of operation under the law, was a most unfavorable one for harvesting owing to continued rains, which halted digging more or less nearly every week, cutting down the work of inspectors with no reduction in expenses, as it was deemed necessary to retain the full force of inspectors for the maximum digging in the constantly anticipated stretch of good weather which never came. As a consequence, the service failed by $247 of being self supporting during the first season. Under anything like normal conditions, the $3 fee will be adequate, and return a moderate surplus.

There is perhaps one point that might be stressed somewhat for the benefit of distant buyers, and that is that the original bill of lading must show the grade of potatoes in accordance with the inspector's report. The railroad agents are required to place such information on the bill of lading in, for example, this form: "U. S. No. 1 Grade, U. S. Inspected." Inspectors are also required to post in each car a placard showing the grade of potatoes, and while there are severe penalties imposed by law for the removal of such placards, it seems that these placards frequently mysteriously disappear. That is a matter that will be given closer attention by the officials this year. After a car of potatoes leaves the state of Kansas, however, it is beyond the Kansas law. Buyers abroad who fail to find the placard in the car should consult their bill of lading. If the car has been reconsigned at outside points and a new bill of lading made, buyers may protect themselves by demanding information on the original bill of lading.

The first year's experience under this compulsory inspection law was eminently satisfactory, so much so as to be noteworthy. It seems more or less common for American citizens to rebel against mandatory statutes that invade the realms

of business. There were no potato growers in the Kaw Valley who appeared seriously to object to the inspection, but a handful were quite decided at first before harvest, in their stand against grading. There was, of course, no disposition on the part of the inspection department to insist on grading, and if one chose to load field-run potatoes that was his privilege, even though it would invariably mean a lower grade, possibly rating as Unclassified. When the test actually came, however, at digging time, every grower in the Valley graded his potatoes intended for carlot shipments, and cooperation all along the line was just about 100 per cent, including growers, shippers, and the railroads.

At the end of the season, there seemed to be general satisfaction with the operation of the law, and indeed a majority of the growers were inclined to the belief that the law was of unusual benefit because of the adversities of the season affecting the appearances of the tubers, mostly owing to the adherence of uncommon quantities of dirt due to the continued wet weather. Under these circumstances, they claimed that without inspection there would have been endless disputes locally and particularly at destination markets relating to quality and prices, causing widespread confusion. Perhaps the best indication of all that the growers and shippers came fully to realize the value of the law may be found in the fact that after the official inspection period ended September 1, voluntary inspection was requested for that portion of the crop yet to be dug and marketed. Ordinarily the potato harvest in the Kaw Valley would have been completed by that date, but the weather was such that perhaps 11 per cent of the potatoes were yet in the ground by September 1. The service was extended on a voluntary basis until harvest was finished, in October, the shippers gladly paying the $3 fee. In this period of voluntary inspection but very few cars were shipped out that were not inspected.

That the year was a trying one suggests that the law was put to about its severest test at the very beginning. How well the work was done under these unfavorable conditions is attested by the fact that out of a total of 4,301 cars inspected, there were only four reversals on reinspection at destination points. This, I understand, is an exceptionally good record. It certainly reflected credit on the service, in a season when the work was unusually difficult and complicated. The one ambition we had was that the inspection should be as nearly 100 per cent perfect as human agencies could make it. That we were able to approximate that goal is laid to the strictly-followed policy of employing only competent inspectors. Naturally, as it was the first year, it was necessary to "break in" quite a

number of men new to the work. These were not only given a thorough course of training before undertaking their duties, but they were paired with seasoned inspectors from abroad who had had years of experience in the government service.

The government supervisor was given a free hand in the selection of inspectors, and cautioned to observe but one injunction, that competent men only be employed and retained. This responsibility was placed upon the government representative because his training and experience eminently fitted him to judge of qualifications. He was as much of a stickler for efficiency as we were. He not only did his work well, but proved to be a good executive. No other factor was considered in the selection of inspectors than that of qualifications for the work.

Inspectors were not only required to do their work promptly and thoroughly, but their services were regularly available on a day-time schedule best adapted to the needs of the potato industry, and besides they were "subject to call at any and all hours however unreasonable," as one of the regulations of the office reads. Not a single car during the season was prevented from rolling promptly because of lack or delay of inspection, although this frequently kept inspectors in the field far into the night. The ambition was to give not only efficient service but prompt service, and this ambition was measurably realized.

In the spring of the prseent year (1928) several meetings were held with potato growers to learn if they had any criticisms or suggestions for improving the service, and if they desired any changes in grades, rules and regulations and methods of inspection. The result was a unanimous decision to continue under identically the same plan as was followed the year before. Expressions at these meetings clearly revealed the faith the producers and shippers had in the efficacy of the law, not only as a means of improving marketing conditions but as an agency for the upbuilding and maintenance of a gilt-edged reputation throughout the markets of the country for Kansas grown potatoes. The general consensus was too much stress could not be placed upon the importance of character in the Valley's output, and with that kind of a spirit future success is well-nigh assured.

It is entirely possible that a compulsory inspection law may not be practicable in every commercial potato-growing district, but it appears to be splendidly adapted to Kansas conditions, where virtually the entire crop is handled in carlots and shipped, sometimes to quite remote parts of the country. Though we have had but one year's experience, I shall be greatly mistaken if the law is not retained, at least in some form, maybe modified and improved, as a permanent instrument for the advancement and prosperity of the Kaw Valley potato industry.

Development of the Early Potato Industry in the United States

By F. J. BLAIR, in Charge Truck Crops, Division of Crop and Livestock Estimates, Bureau of Agricultural Economics.

The early development of the trucking industry on a commercial scale along the Central Atlantic Seaboard in the States of New Jersey, Deleware and Maryland was due primarily to the concentration of large numbers of people in large cities in close proximity to the region at an early date. It was further due to the low altitude of the land and a soil well adapted to the growing of vegetable crops. The region is also favored by the presence of large bodies of water, being protected on the east by the Atlantic ocean and on the west by Delaware and Chesapeake Bays which have a modifying effect on the climate and enable the planting of truck crops much earlier than in other localities in the same latitude.

In the earliest times transportation was the limiting factor.

Previous to 1860 truck farming was unknown except to a very limited extent along the steamboat and railway lines leading out 50 miles or so from a few of the larger northern cities. Long Island (N. Y), New Jersey, Delaware and Southern Illinois appear to have been at that time the leading truck centers of the country (Census of 1890 Agriculture Page 592.)

The first all-rail shipment was made from Norfolk, Virginia, in 1885 but in 1854 the steamer Roanoke carried the first shipment of 200 barrels of garden truck to New Orleans (Census of 1900 Vol. V, Part, Page 204).

These statements show how slowly the movement of truck was advancing southward. Early Irish Potatoes and Cabbage are comparatively stable crops and can be shipped fairly long distances by rail without material damage, such a movement by rail probably did begin about 1885 when the first all-rail shipment was made from Norfolk. The production of Early Irish Potatoes had become large in Long Island, New Jersey, Maryland and the Eastern Shore counties of Virginia in 1889, helped by the slow progress and lack of competition southward. We have only cenus figures for Irish potatoes up to 1910. The census of

1890 enumerated among vegetables the acreage of Irish potatoes only and that crop has been carried through each succeeding census as shown in the table below. The census does not distinguish between early and late potatoes and in the late-early sections (Long Island and New Jersey), there is no safe basis for making such a division prior to the census of 1919, after which period the estimates of the Bureau of Agricultural Economics are available. Fortunately, with the exception of Long Island and New Jersey the census enumeration of the Irish potato crop is for the early crop in strictly commercial regions where, if fall potatoes are grown at all, they are grown in very limited quantities for home consumption.

In separating the early potato crop from the late in the selected commercial region in Long Island and New Jersey, all shipment prior to September 1 are classed as early.

The acreages for five census periods as enumerated for the selected commercial regions on Long Island and in New Jersey follow:

Central Atlantic Division	Census 1890	Census 1900	Census 1910	Census 1920	Census 1925
	Acres	Acres	Acres	Acres	Acres
New Jersey	33,061	36,731	60,226	71,881	56,071
New York, L. I.	7,133	17,518	24,092	33,244	38,476
Total	40,194	54,249	84,318	105,125	94,547
Per cent + or —		+35	+55	+25	—10

The years 1919 and 1924 as estimated by the Bureau of Agricultural Economics compare with the total acreage for censuses of 1920 and 1925, and indicate that 53 per cent of the product of this census acreage are shipped from New Jersey as Early potatoes in 1919 and 46 per cent in 1924.

In 1927 the product of 30,000 acres or about 70 per cent of the total acreage grown in the region was shipped prior to Sepember 1.

New Jersey reached a peak in Early Irish Potatoes acreage in 1920 of 42,480, another in 1923 of 41,100 acres, and third peak in 1925 of 40,000 acres. In 1927 the acreage was 30,000. There is an indicated increase for 1928 to 31,500 acres. Long Island has ranged from about 9,000 to about 11,000 acres for the last four years. It, therefore, appears that the upward trend of the

industry has been checked and that the acreage will tend to vary within narrow limits under influence of price and demand for a number of years. From the table below showing the Eastern Shore of Maryland and Virginia it appears that production is also becoming stabilized in those earlier regions. Delaware has not been considered an early Irish potato region.

Central Atlantic Division	Census 1890	Census 1900	Census 1910	Census 1920	Census 1925	B.A.E. 1927
	Acres	Acres	Acres	Acres	Acres	Acres
Maryland, E. Shore	1,915	4,262	3,742	16,842	16,014	15,300
Virginia, E. Shore	4,272	11,475	30,628	53,267	68,716	60,000
Total	6,187	15,737	34,370	70,109	84,730	75,300
Increase or decrease Per cent + or —		+154	+118	+104	+21	—11

It is to be noted that the percentages of increase for the three ten-year periods from 1890 to 1920, although in a decreasing ratio, were much larger than for the northern members of the division.

The total increase for the period 1890 to 1924 in the northern section of the division was 135 per cent compared with 1,272 per cent in the southern section. It is further to be noted that these figures are not strictly comparable as in Long Island and New Jersey the census acreages are for both early and late potatoes, while on the Eastern Shore of Maryland and Virginia the acreages are those of early potatoes only.

South Atlantic Division	Census 1890	Census 1900	Census 1910	Census 1920	Census 1925	B.A.E. 1927
	Acres	Acres	Acres	Acres	Acres	Acres
Virginia, Norfolk Sec.	7,760	12,426	12,125	15,271	11,701	14,000
Virginia, Other	1,160	1,877	4,779	4,873	4,846	4,700
North Carolina	3,674	9,480	12,509	16,297	22,895	35,000
South Carolina	2,253	6,022	5,606	8,818	18,447	17,780
Georgia	1,400	2,913	2,026	1,891	3,142	2,250
Total	16,247	32,718	37,045	47,150	61,031	73,730

The Norfolk Section of Virginia

This is one of the earliest and most outstanding trucking sections of the country, having made its first shipment of 200 barrels of garden truck to New York in 1854.

The entire coast line from Norfolk south to Beaufort, South Caroline, is very much broken by bays, sounds, and the estuaries of many rivers and creeks, through the means of which tidewater enters far in the land area, exerting a marked influence upon climatic conditions, which is further aided by the presence of the Gulf Stream at no great distance from the coast line at any point. The climate of the Norfolk section is so modified and controlled by these influences and the low-lying altitude of the land that it enjoys a winter climate as mild and little subject to sudden changes and to the influence of destructive frosts and freezes as may be found many miles to the southward. It is therefore possible to grow such hardy vegetables as spinach and kale throughout the winter without protection, and to plant a cabbage crop in November to be harvested for the early spring market.

The Norfolk section of Virginia includes Isle of Wight, Nansemond, Norfolk and princess Anne Counties.

The growing of Early potatoes was well established in the Norfolk section in 1890 when the census enumerated 7,760 acres which acreage after increasing to 15,271 in 1919, decreased to 11,701 in 1924, rose to 14,000 acres in 1927, with a small indicated increase for 1928.

North Carolina

The first all rail shipment of garden vegetables was made from eastern North Carolina in 1887.

There were no outstanding Early Irish Potato regions in North Carolina in 1890 and the state is credited with only 3,674 acres by the census of that year. The acreage increased rapidly for each census period and in 1924 is given at 22,895 acres an increase for the period of 523 per cent. There was a further increase of 53 per cent from 1924 to 1927.

South Carolina

The first all-rail shipment was made from Charleston, South Carolina in 1888, one year later than from North Carolina and two years later than from the Norfolk section, but Charleston had been in touch with northern markets through the medium of water transportation.

In 1890 Berkeley, Charleston and Colleton were the outstanding counties in Early Irish Potato acreage and all are still growing the crop. Charleston has run away from the others, however, and in 1924 lead the state with 8,359 acres with Beaufort County second, 5,333 acres. In 1890 Beaufort had but 30 acres of potatoes and Charleston 921 acres.

In 1927 the acreage of the state was estimated to be 17,780 or slightly less than in 1924.

Georgia, the home land of the watermelon the remaining member of the division is not an important producer of Early Irish Potatoes, but has had around 1,000 acres in the Savanah section from early times. The states's total for 1927 is 2,250 acres.

The district as a whole increased the acreage from 16,240 in 1890 to 61,031 in 1924 or about 276 per cent. There was a further increase of 29 per cent from 1924 to 1927. The indication for 1928 is for an increase of 2 per cent over 1927.

THE WINTER GARDEN DIVISION

This division includes the states of Florida, Alabama, Mississippi, Louisiana, Texas, New Mexico, Arizona and Southern California.

The 30th parallel of latitude passes just north of St. Augustine, Florida, New Orleans, Louisiana, and Houston, Texas. The Gulf Coast line of Mississippi and Alabama are just north of parallel 30. From Florida to Southern Texas the warm waters of the Gulf of Mexico temper the climate rendering it possible to grow hardy vegetables in the southern tiers of counties of Alabama, Mississippi and Louisiana. The Equatorial Current enters the Gulf of Mexico through the Carribean Sea and flows out around the Southern end of Florida, whose east coast is made more humid and equable by its warm current.

The states of Florida, Alabama, Louisiana, Mississippi and Southern Texas have been producing Early Irish potatoes since before 1890. At that time Louisiana was the outstanding region in this Gulf group, 4,045 acres of potatoes being enumerated for La Fourche Parish which continues to be the outstanding parish for the state. The outstanding position of Louisiana as a potato producer at that time was probably caused by a large nearby consuming center in New Orleans and water and rail connections with large cities to the north.

The Pacific Coast member of this division, California, was still more prominent at this time, Los Angeles County being credited with 4,272 acres of Early Irish Potatoes. It is to be noted that in company with La Fourche parish, Louisiana, this county has retained its position.

Florida, which state was destined to take the lead in potato production in the Winter Garden Division, had only 1,064 acres of Early Irish Potatoes in 1890 and did not become prominent in the industry until 1910 when 7,568 acres were enumerated for the state. At this time Texas was the outstanding state with 18,785 acres, Louisiana with 15,990 ranking second. Southern California was third with 9,164 acres. In the next decade, census of 1920 for crop year 1919, Florida had taken the lead with 16,650 acres of Early Irish Potatoes, Louisiana had taken second place with 16,389 acres and Texas had dropped to fourth place with 10,421. Southern California was in third place with 14,096 acres.

In the next five years, census of Agriculture of the year 1924, Florida increased her acreage to 27,416 acres and Louisiana fell off a little to 15,548 acres. In 1927 these two states, which seem to have established themselves in the lead, increased their acreages to 28,000 and 21,860 acres respectively, Texas nearly doubling to 18,870 acres. During the period 1889 to 1924, Florida increased her acreage 2,477 per cent, Alabama 885 per cent, Texas 343 per cent, Louisiana 119 per cent, Mississippi 99 per cent and Southern California 6 per cent. The increase for the division was 226 per cent. The Central District of California has a considerable acreage of Irish Potatoes part of which is early as in New Jersey. This acreage which showed a tendency to increase up to 1910 has since decreased more than 50 per cent as compared with the census of 1890.

The acreage in Alabama which in the census year 1890 (crop year 1889) was practically all in Mobile County has shifted so that Baldwin and Escambia Counties now lead Mobile and Monroe County has taken fourth place.

Prior to the census for the year 1919 the Hastings District of Florida consisting of Flagler, Putnam and St. Johns Counties was the early Irish Potato district to the exclusion of all other regions, but the East Coast South and the West Coast South which included the Okeechobee region began to assume prominence at that time and in 1924 these regions had 1,623 acres and 2,9100 acres respectively of the earliest potatoes grown in the state. With the proper drainage, which now seems assured, enabling the development of the "Glades" around Lake Okeechobee to a degree that indicates their expansion into the leading trucking region of the country, a rapid expansion of early Irish Potato acreage in the region around the eastern and southern end of the lake seems probable.

There follows a table giving Early Irish Potato acreage for five census crop years 1889 to 1924 and the 1927 estimate of the Bureau of Agricultural Economics:

Winter Garden Division	Census 1890	Census 1900	Census 1910	Census 1920	Census 1925	B.A.E. 1927	1890 comp. 1925
	Acres	Acres	Acres	Acres	Acres	Acres	percent
Florida	1,064	3,382	7,568	16,650	27,416	28,000	+2,477
Alabama	993	3,179	3,525	2,557	9,780	13,200	+885
Mississippi	834	1,105	2,029	2,171	1,656	1,700	+99
Louisiana	7,113	7,667	15,990	16,389	15,548	21,860	+119
Texas	2,198	5,257	18,785	10,421	9,747	18,870	+343
Calif. (S. N.)	7,528	7,284	9,164	14,096	7,972	9,300	+6
Total	19,730	27,874	57,061	62,284	72,119	92,930	+226
% of increase		+41	+105	+09	+16	+29	

South Central Division

There remains the South Central Division which includes two Islands, the Kaw Valley-Orrick District of Kansas and Missouri and the Muskogee-Fort Smith District of Oklahoma and Arkansas and the Louisville District of Kentucky. The acreage in these district is shown in the following table. There is an uncertain district in Nebraska, the Kearney District, which produces and ships when circumstances are favorable.

South Central Division	Census 1890	Census 1900	Census 1910	Census 1920	Census 1925	B.A.E. 1927
	Acres	Acres	Acres	Acres	Acres	Acres
Kans. (Kaw Valley)	18,714	26,327	19,332	11,473	17,722	17,300
Mo. (Orrick Dist.)	3,182	4,779	8,299	2,485	4,802	5,180
Oklahoma		703	14,376	10,310	13,946	14,940
Arkansas	3,579	11,919	11,324	13,590	9,103	3,890
Kentucky	5,009	6,796	9,688	11,212	11,186	5,340
Total	30,484	50,524	63,019	49,070	56,759	46,650

The Outlook for 1928

The acreage of Early Irish Potatoes has been increasing steadily since 1925. The low price of 92c per bushel received in 1924 caused a small decrease in acreage in 1925 to 298,300 acres and a rise in price to $1.39 per bushel. In 1926 the acreage was

309,300 or slightly less than in 1924 and the price increased to $1.54 per bushel. In 1927 the acreage was again increased to 330,050 and the price paid to growers dropped to $1.40. The preliminary acreage for 1928 for the early states, Alabama, California, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Texas and Virginia shows an increase of 6 per cent. The estimated intention to plant for the second early states, Arkansas, Kansas (Kaw Valley), Kentucky, Maryland, Missouri (Orrick District), Nebraska (Kearney District), New Jersey and Olkahoma shows an increase over last year of 16 per cent. An increase for the total area of about 8 per cent raising the acreage figure to 356,310 for 1928, an increase over 1925 of about 20 per cent.

Quoting the Outlook for February 1928—page 38:

"In the South, there are as yet no indication of a general increase of acreage, though a few states seems to be planning larger plantings. However, the price of late potatoes is lower, the quantity still in storage probably is greater, particularly in the west, and the chances of profit seem hardly as good as they were a year ago.

"Some of the intermediate states, especially along the Atlantic seaboard, had exceptionally heavy yields last season, which prolonged their marketing period and slowed down the early market for northern or main-crop potatoes. The chances for a repetition of such exceptional yields are not great, but even with average yields, if this group materially increases its plantings, there is danger of heavy supply and low prices during the late summer period."

A table showing an estimate of the commercial acreage intended to be planted in the second early states and the preliminary acreage in the early states compared with previous years follows:

EARLY IRISH POTATOES

State	1925	1926	1927	Intended 1928
	Acres	Acres	Acres	Acres
Winter Garden Division				
Florida	21,920	23,070	28,000	30,000
Alabama	8,940	12,750	13,200	17,160
Mississippi	1,240	1,300	1,700	1,950
Louisiana	15,630	20,000	21,860	18,940
Texas	10,260	11,580	20,020	18,520
California	11,850	14,980	17,800	19,350
Total	69,840	83,680	102,580	105,920
South Atlantic Division				
North Carolina	22,100	29,000	35,000	38,150
South Carolina	14,660	18,720	17,780	20,450
Georgia	2,010	2,250	2,250	2,320
Va. Norfolk	15,500	18,000	14,000	14,700
Va. Other	4,550	5,000	4,700	4,960
Total	59,020	72,970	73,730	80,580
Central Atlantic Division				
Va. E. Shore	70,000	66,000	60,000	63,600
Maryland	13,150	14,800	15,390	15,240
New Jersey	40,000	25,650	30,000	31,500
Total	123,150	106,450	105,390	110,340
South Central Division				
Kentucky	5,620	5,620	5,340	5,340
Missouri	4,800	5,000	5,180	5,830
Kansas	16,500	15,800	17,300	18,700
Arkansas	3,400	4,180	3,890	7,880
Oklahoma	14,500	14,400	14,940	20,020
Nebraska	1,500	1,200	1,700	1,700
Total	46,320	46,200	48,350	59,470
Grand Total	298,330	309,300	330,050	356,310

Shipping usually begins in carloads and reaches its peak as stated below:

Shipments begin about	Shipments reach peak about
Florida, 1st week in March	May 1
Texas, 3rd week in March	May 21
Louisiana, 1st week in April	April 30
Alabama, 4th week in April	May 15
Mississippi, 2nd week in May	June 1
California, S. D., 3rd week in May	June 25
SOUTH ATLANTIC DIVISION	
Georgia, 4th week in April	May 25
South Carolina, 1st week in May	May 21
North Carolina, 4th week in May	June 18
Virginia, Norfolk, 1st week in June	June 12
CENTRAL ATLANTIC DIVISION	
Virginia, E. S., 2nd week in June	July 10
Maryland, E. S., 3rd week in June	July 24
New Jersey, 4th week in July	August 14
Long Island, 4th week in July	August 28
SOUTH CENTRAL DIVISION	
Arkansas, 3rd week in May	June 19
Oklahoma, 1st week in June	June 15
Missouri, 4th week in June	July 31
Kansas, 4th week in June	July 24
Kentucky, 1st week in July	August 18

Crop and Market News

POTATO ESTIMATE REDUCED

(Contribution from the Bureau of Agricultural Economics)

The final crop report on 1928 potatoes showed total production of 462,943,000 busels. This is about 2,700,000 bushels less than were forecast in November, but 60,000,000 more than the revised estimated for 1927, and is the largest crop ever grown in the United States. During November, the production figure for Minnesota was revised upward by 1,500,000 bushels, that for North Dakota was raised by 3,000,000, and the Wisconsin estimate was moved up 600,000 bushels. About 1,000,000 bushels each were added to the crops in Virginia and North Carolina. Important decreases since November were 2,500,000 bushels in Colorado, 2,000,000 in Missouri, 900,000 in Washington, about

700,000 each in Pennsylvania and Ohio, 600,00 each in Montana and Alabama, and 500,000 each in New York and South Dakota. The combined decreases more than offset any increases, so that the potato situation is a little stronger than it had been before. Average yield per acre during 1928 was 121 bushels, compared with 116 in 1927. Average farm price was 54c per bushel, or 42c less than on December 1, 1927, and the total crop has an estimated farm value of $250,000,000.

The total crop in 19 surplus producing late-potato states is estimated at 309,717,000 bushels, compared with 280,470,000 last season. This is an increase of about 10%. By mid-December last season, nearly half the total 1927-28 movement from these important shipping states had been completed. Slightly over 99,000 cars had been shipped; whereas the corresponding figure for the present season is only 73,000 cars. With carlot movement fully one-fourth less than to this time in 1927 and production one-tenth greater than in 1927, it is plain that holdings on January 1 will exceed those of a year ago.

New potatoes were beginning to arrive from Bermuda and Florida, and were jobbing in New York around $8-$10 per barrel. Small-sized No. 2 Bliss Triumphs from Florida brought $1.50-$1.75 per bushel basket. Spring plantings in the lower Rio Grande Valley of Texas may be one-fourth lighter than a year ago. The potato conference in Chicago during early December recommended a general reduction of 10½ to 20% in plantings for 1929 shipment and an increased duty on imported stock. Strict grading of all potatoes was also urged.

Shipments dropped to an average of about 3,000 cars a week but had increased slightly again during mid-December. North Central shipping points quoted slightly higher f. o. b. prices at 68c-80c per 100 pounds, as against a level of 95c in western New York and 80c-85c in northern Maine. Russet Burbanks declined a bit in southern Idaho to 70c-80c. Carlot sales in Chicago were mostly higher than in November at 85c-$1.10 on northern Round Whites, $1.05-$1 15 on Red River Ohios, and $1.55-$1.75 on Idaho Russets. Eastern jobbing centers held nearly steady with a range of $1-$1.50 per 100 pounds.

Notes

COLORADO

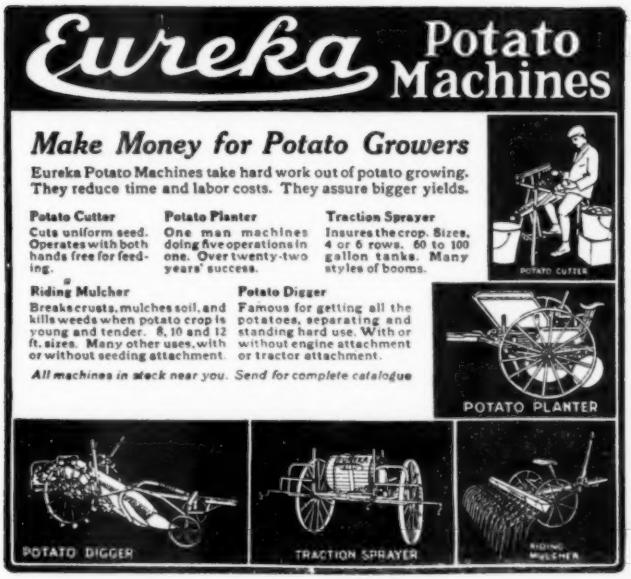
A Farmer's Potato Grading Warehouse That is Most Efficient.

The Center, Colorado Potato Growers' Cooperative Association is one of twenty under the general supervision of the Colorado Potato Grower's Exchange. The local manager of the Center

Association is W. A. Sauder. This local last year handled 1213 car loads of potatoes for its members, and is one of eight such locals in the San Luis Valley. This Valley is the largest commercial potato district in Colorado. The gross amount of receipts the Center Association received for potatoes last season was nearly three quarters of a million dollars, $737,694.00.

Because of the large volume of potatoes handled, Manager Sauder determined he would make the quality sent out the very best and most uniform possible. Running all the potatoes of the individual grower members over a power grader at the warehouse, is the only way to secure a uniform grade. He must first sell his idea to his local members. For several seasons, in a medium sized warehouse, with a single power grader, Mr. Sauder had demonstrated the importance and value of uniform grading in the "Colotato Brand," furnihed the sales manager of the exchange to send "To the Trade."

Now he wanted to run the entire volume of the potato crop grown by members of the Center local, through a Power Grading Plant. He called General Manager W. F. Heppe of the Colorado Potato Growers' Exchange into conference. They worked on plans for weeks, called in the sales manager for what they believed to be a most practical and efficient power grader, and


Eureka Potato Machines
Make Money for Potato Growers
Eureka Potato Machines take hard work out of potato growing. They reduce time and labor costs. They assure bigger yields.
Potato Cutter
Cuts uniform seed. Operates with both hands free for feeding.
Potato Planter
One man machines doing five operations in one. Over twenty-two years' success.
Traction Sprayer
Insures the crop. Sizes, 4 or 6 rows. 60 to 100 gallon tanks. Many styles of booms.
Riding Mulcher
Breaks crusts, mulches soil, and kills weeds when potato crop is young and tender. 8, 10 and 12 ft. sizes. Many other uses, with or without seeding attachment.
Potato Digger
Famous for getting all the potatoes, separating and standing hard use. With or without engine attachment or tractor attachment.
All machines in stock near you. Send for complete catalogue
POTATO CUTTER
POTATO PLANTER
POTATO DIGGER
TRACTION SPRAYER
RIDING MULCHER

Many Successful Potato Growers use Eureka Two-Row Fertilizer Distributors and Eureka Two-Row Potato Planters

EUREKA MOWER CO. Utica, N. Y.

— SYNTHETIC NITROGEN —

Concentrated High-analysis Fertilizer *for* POTATOES

There is true economy in the use of concentrated air-nitrogen fertilizer. You save on the unit cost of plant food, on freight and hauling, and on the labor of applying. Results have been universally satisfactory.

Nitrophoska—15% Nitrogen (18.2% Ammonia), 30% Available Phosphoric Acid, 15% Potash. A concentrated, complete, chemical fertilizer—not a mixture. Every particle is like every other particle and contains all three plant food elements in available form. You get 60 pounds of actual plant food in every 100 pound bag.

Urea—46% Nitrogen (55.9% Ammonia). A very concentrated carrier of nitrogen in pure organic form—the same form in which it is found in liquid manure. In seven years of testing, Urea has given excellent results as a source of nitrogen for potatoes.

Leunasalpeter—26% Nitrogen (31.6% Ammonia). A highly concentrated nitrogen carrier containing both nitrate and ammonia nitrogen—¼ as nitrate, ¾ as ammonia. It is extensively used in fertilizer mixtures for potatoes.

On request, we will send a copy of "Photographs" of Synthetic Nitrogen Works, also Report of The International Nitrogen Conference. Our soil scientists will gladly help you with your fertilizer problems.

SYNTHETIC NITROGEN PRODUCTS CORPORATION

285 Madison Ave., New York

—"It's Nitrogen from the Air"—

the result is, what the writer believes to be the largest potato grading warehouse of its kind in the nation.

Let us get a conception of this plant that has proven so satisfactory and so efficient.

Exterior Size

The building is 190 feet long by 60 feet wide. The construction is absolutely frost proof throughout. It has a stucco exterior finish that lends an attractiveness to its appearance.

Machinery Installed

Straight in line through the building, are placed overhead conveyors for filling overhead hopper bins, for the even weighing of 16 carloads of potatoes. Each hopper bin holds one carload of 30,000 pounds. To each four sets of bins are connected a large power grader. Each grader is equipped with roller picking tables where one or two men can readily handle each unit. Here on the table, all market potatoes are examined and any irregular off shaped, diseased or sun burned potatoes are eliminated. This absolutely insures a good uniform grade for the new, clean branded sacks into which the 1928 crop of U. S. No. 1 grade is placed, stamped, "Grown in the San Luis Valley, Colorado."

The culls and seed size potatoes are separated out from the table stock or markets, by machinery, before the latter come to the conveyors, bringing same to the roller picking table. The culls and seed size potatoes finally reach hoppers directly over place in an inside driveway, for trucks to unload. This drive gives farmers a good weather protected place to unload into conveyors. As soon as the field run potatoes are emptied into conveyors, the grower can help himself to his sacked culls and seed and take same to his farm potato cellar or barn on return trip

Double Loading Tracks

The warehouse has doubled trackage just outside. There are also, at this warehouse four power elevators for loading sacks into cars, which very materially increase the handling facilities.

Capacity

This Center Grading Plant can grade and load twelve cars per day.

How Financed

The warehouse is capitalized for $21,000. It is financed by loans made by the Colorado Potato Warehousing Corporation. This is a subsidiary corporation of the Colorado Potato Growers' Exchange. Center grower members permit certain percentage deductions to be made from potatoes, sold through the warehouse. For these deductions they receive common stock in the Center Warehouse. Thus the grower members pay for the ware-

house on the installment plan, to be the property of the members of the local association when paid for.

Summary

Power grading is a long step from farmer field grading with a hand sorter, that has never given complete satisfaction. The Center Grader Warehouse is believed to be the "last word" in speedy, efficient, satisfactory grading. It protects the Exchange brand, gives increased demand from satisfied consumers and brings in the long run, a more stable market to the farmer producer at more satisfactory prices. More details can be secured by addressing the Editor of Capper's Farmer, Topeka, Kansas.

A similar but smaller grading warehouse, built of adobe, has just been completed by the Mosca Potato Association, a new warehouse at Estrella now gives to the San Luis Valley Associations—La Jara, Monte Vista, Del Norte and Hooper power grading advantages.

These power graders enable farmers to obtain their culls for farm lot feeding at a minimum cost. This is quite an item in this year of cheap spuds.

It also enables them to place on the market the best and most uniform quality of table stock ever sent out of the Valley.

As fast as it can be done all local associations in Colorado will, no doubt, follow the lead of the Center Association.

—W. H. OLIN.

WASHINGTON

The Pacific Northwest Potato show and conference, held in Spokane last week under the auspices of the agricultural bureau of the Spokane Chamber of Commerce was pronounced one of the best in its history.

Exhibits by 129 growers from Washington, Oregon, Idaho, Montana, British Columbia and Alberta were entered, and more than 200 growers from all parts of the northwest were in attendance.

The headlight of the show was the judging and grading contests by 4-H clubs of Washington and northern Idaho and judging contests between vocational Smith-Hughes classes from high schools in Idaho, Washington and Montana.

A 12-pound package of first prize potatoes was sent by air mail to President Coolidge with the compliments of the Pacific Northwest Potato Growers Association. The postage was more than $18.

These potatoes were grown by Henry Seman, the pioneer in the potato growing industry of Klamath Falls, Oregon.

He grows from thirty-five to sixty acres of potatoes a year in rotation with clover and is a user of certified seed. He standardizes in the production of graded Netted Gem potatoes.

Mr. Seman is a director of the Pacific Northwest Potato Growers' Association of Spokane and is president of the Klamath County Potato Growers' Association of Klamath Falls.

NATIONAL POTATO CONFERENCE

All angles of the potato situation were discussed at the National Potato Conference held in Chicago, December 4th and 5th. Representatives from 44 states endorsed government grading, compulsory branding, shipping point inspection and licensing of dealers.

A National Potato Committee was appointed to perfect plans for the improvement of the potato industry.

Members of the committee with the districts represented are as follows:

District	Representative	Address
1.	New England, C. A. Powers,	Fort Fairfield, Maine.
2.	New York, Daniel Dean,	Nichols, Tioga Co., New York.
3.	New Jersey, Barclay,	Cranberry, New Jersey.
4.	Pennsylvania, Miles Horst,	Harrisburg, Pa.
5.	Ohio, Tennessee, Kentucky, Indiana, Illinois, Perrin C. Miller,	Chicago, Ill.
6.	Michigan, F. P. Hibst,	Cadillac, Mich.

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Sunbury, Pennsylvania

7. Wisconsin, J. F. Jardine, Waupaca, Wis.
8. Minnesota, Chas Hechtman, Osseo, Minn.
9. Virginia-Maryland, C. R. Waters, Onley, Virginia.
10. North Carolina, South Carolina, Georgia and Florida, Homer L. Robinson, Hastings, Florida.
11. Mississippi, Alabama, Louisiana and Texas, K. H. McDavitt, Brownsville, Texas.
12. Kansas, Oklahoma and Missouri, R. T. Payne, Muskogee, Okla.
13. Nebraska, Wyoming and Montana, F. M Harrington, Bozeman, Mont.
14. North Dakota, South Dakota, P. F. Trowbridge, Fargo, N. Dak.
15. South Idaho-Utah, C. J. Carlson, Idaho Falls, Idaho.
16. North Idaho, Washington, Oregon, R. H. Kipp, Portland, Ore.
17. Colorado, D. W. Aupperle, Grand Junction, Colo.
18. California, Arizona, Nevada, H. G. Zuckerman, Berkeley, Calif.

Following are the resolutions endorsed by the National Potato Conference:

1. "RESOLVED, that this meeting go on record as urging the increase of the existing duty on potatoes imported from any foreign country to the United States to $1.00 per 100 pounds, with a provision for an advalorem duty in excess of a stipulated minimum."

2. "RESOLVED, that this meeting go on record as endorsing a federal license law regulating and supervising wholesale produce dealers, the principles of which are outlined in Senate Document S-1294, commonly known as the 'Borah Bill.' "

3. "RESOLVED, that this meeting urge a reduction of ten to twenty per cent potato acreage for 1929 through the National and State Departments of Agriculture, and all other existing agencies, including banks, fertilizer companies, and related interests."

4. "RESOLVED, that this meeting go on record as being in favor of the grades for potatoes now known as United States Grades."

5. "RESOLVED, that this meeting endorse National shipping point inspection of potatoes to conform to the grades already established by the United States Department of Agriculture."

6. "RESOLVED, that this meeting go on record as urging the increase of the existing duty on potato starch imported into the United States from foreign countries to $3.00 per 100 pounds, and on dextrine to $4 50 per 100 pounds."

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RECORD OF GOVERNMENT FIELD INSPECTION, 1928

FIELD INSPECTION OF POTATOES—NOVA SCOTIA—1928

Name and Address	Variety	Acres	Inspection No.	Black Leg %		Leaf Roll %		Mosaic %		Wilt %		Foreign %	
				Inspection 1st	2nd	Inspection 1st	2nd	Inspection 1st	2nd	Inspection 1st	2nd	Inspection 1st	2nd
Herbert	I.C.	5	7001	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oyler, Ltd.	I.C.	6	7003	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Walter Steel	I.C.	4½	7861	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
strain, R. R.	I.C.	—½	7864	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
No. 1, Halls	I.C.	1	7866	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Harbor,	G.M.	5	7860	.....	.....	0.16	.....	0.16	.....	.....	.....	.....	.....
Kings Co.,	G.M.	—½	7863	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
N. S.	G.M.	2½	7865	.....	.....	.....	.....	0.3	.....	.....	.....	.....	.....
	G.M.	8½	7873	.....	.....	.....	.....	0.14	.....	.....	.....	.....	.....
	G.M.	6	7874	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	G.M.	13	7875	.....	.....	.....	.....	Seen	.....	.....	.....	.....	.....
	G.M.	8	7876	.....	.....	.....	.....	Seen	Seen	.....	.....	.....	.....

7. "RESOLVED, that this meeting go on record as in favor of compulsory branding or tagging of all potatoes shipped, showing weight and grade in accordance with the grades now established by the United States Department of Agriculture."

8. "RESOLVED, that the National Potato Committee appointed by this meeting, be asked to confer with the Crop Reporting Section of the Bureau of Agricultural Economics, United States Department of Agriculture, relative to improvements that might be made in the service."

9. "RESOLVED, that the most appreciative thanks of this meeting be extended to The Agricultural Council of the Central Western Shippers' Advisory Board for their generaus labors in sponsoring, organizing and conducting this constructive and important conference."

10. "RESOLVED, that the heartfelt thanks of this meeting, and each individual thereof, be extended in sincere appreciation to our kindly, able and efficient chairman, Mr. R. E. Shepperd."

11. "RESOLVED, that this meeting go on record urging the United States Department of Agriculture, State Department of Agriculture, County Agents, Agriculture Instructors, and every organization represented here to learn all facts concerning the value and factor of feeding potatoes to live stock, especially hogs."

(Signed) COMMITTEE ON RESOLUTIONS AND RECOMMENDATIONS,
By J. C. Briggs, Chairman.

Review of Recent Literature

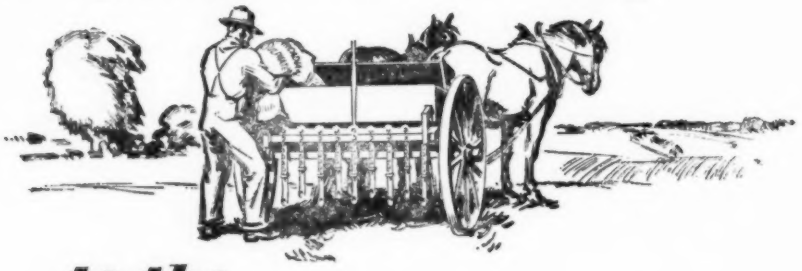
60.7

McINTOSH, T. P.—Investigation on Intervarietal Differences of a Chemical Nature in the Mature Potato Tuber—The Scottish Journ. of Agric. 40: 304-311, July 1928. The author states that the paucity of constant morphological characters in the potato tuber makes it desirable to investigate the possibilities of physiological and chemical differences Physiological differences may occur in the sprouting of the tubers of different varieties; their reaction to wart disease, etc. Chemical differences between mature tubers of varieties have long been recognized in so far as their composition is concerned in which there may be a considerable fluctuation from year to year. No substantial variation in solanin content was noted by Artschwager. The author's studies were confined to another chemical factor known as "flavones" which are universally distributed in plants. In bulk "flavones" are yellow but they exist in the cell sap in such min-

ute quantities as to be practically invisible. When treated with alkalies however an intense yellow color is developed. Small sections of potato tubers about one-eight inch thick taken from the middle of the long axis of the tuber were immersed in a normal solution of caustic potash and then laid out on petri dishes for approximately five minutes. During this time the yellow color developed to its full intensity and then remained constant for at least 20 minutes. The degree of color intensity served as a basis for the grouping of varieties. Four color intensities were recognized (1) Very faintly yellow; (2) Faint yellow; (3) Yellow; (4) Deep yellow. Another chemical test known as the "Oxidase test" was also studied. The test consisted in applying to the surface of small sections of the potato by means of a brush a few drops of a 0.5 per cent solution of Benzidine in 50 per cent alcohol. The treated sections were allowed to lie in petri dishes for 60 minutes in a laboratory at a temperature of 40°F. Some varieties develop a rich brown color while in others only a faint tone is reached. A third test based on the blackening of potato tissue and the tyrosinase reaction was also employed. When a potato tuber is cut and allowed to lie exposed to the air for some time it usually reddens, later the red color disappears and is replaced by black. These changes are due to the oxidation of a substance known as tyrosine through the agency of the enzyme tyrosinase. The production of the red requires the presence of the enzyme and takes place only in the presence of oxygen The red substance changes spontaneously into a colorless substance, and the latter is finally oxidised to form melanim, which gives rise to the black coloration. The last two processes do not require the presence of the enzyme. As all varieties do not blacken to the same extent when cut it affords a basis of separation. Transverse slices of potatoes were cut as in the first test and were lightly scratched with a silver fruit fork and then immersed in a solution of sodium carbonate having a pH of 8.3 for about 30 seconds, after which they were placed in petri dishes and incubated at 37°C for 30 minutes in a moist chamber, care being taken not to use up the oxygen supply. In another test similar slices were treated with a few drops of a 0.2 per cent solution of paracresol. The red coloration which developed appeared in about 10 minutes. A fourth test involved the steeping of small sections of the tuber for two minutes in a 20 per cent solution of nicotine after which they were exposed to the air. The color reactions obtained were not always the same. The cortex or band of tissue next to the skin in some varieties turns gradually brown and in about 30 minutes black, while that of other varieties are not affected. The author's conclusions are that the tests indicated afford useful and simple means for differentiating the tubers of many potato varieties. The investigations made are only regarded as preliminary to further studies.

—W. STUART.

Right from the bag



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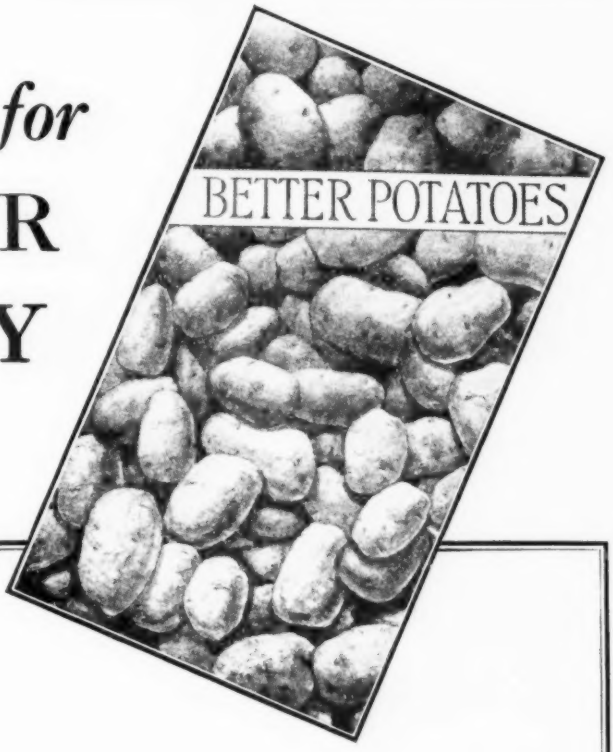

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